

• ABSTRACT

Scientific objectivity is neither monolithic nor immutable: our current usage is compounded of several meanings – metaphysical, methodological and moral – and each meaning has a distinct history, as well as a history of fusion within what now counts as a single concept of 'objectivity'. The rise of aperspectival history in nineteenth-century science is one strand of this plaited history of objectivity, as embodied in scientific ideals and practices. It is conceptually and historically distinct from the ontological aspect of objectivity that pursues the ultimate structure of reality, and from the mechanical aspect of objectivity that forbids interpretation in reporting and picturing scientific results. Whereas ontological objectivity is about the fit between theory and the world, and mechanical objectivity is about suppressing the universal human propensity to judge and aestheticize, aperspectival objectivity is about eliminating individual (or occasionally group) idiosyncracies. It emerged first in the moral and aesthetic philosophy of the late eighteenth century and spread to the natural sciences only in the mid-nineteenth century, as a result of a reorganization of scientific life that multiplied professional contacts at every level, from the international commission to the well-staffed laboratory.

Objectivity and the Escape from Perspective

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Does Objectivity Have a History?

Our usage of the word 'objectivity' (French *objectivité*; German *Objektivität*) is hopelessly but revealingly confused. It refers at once to metaphysics, to methods, and to morals. We slide effortlessly from statements about the 'objective truth' of a scientific claim, to those about the 'objective procedures' that guarantee a finding, to those about the 'objective manner' that qualifies a researcher. Current usage allows us to apply the word as an approximate synonym for the empirical (or, more narrowly, the factual); for the scientific, in the sense of public, empirically reliable knowledge; for impartiality-onto-

self-effacement and the cold-blooded restraint of the emotions; for the rational, in the sense of compelling assent from all rational minds, be they lodged in human, Martian, or angelic bodies; and for the 'really real', that is to say, objects in themselves independent of all minds except, perhaps, that of God. In its thick layering of oddly matched meanings – it is not self evident, for example, what the repression of the emotions has to do with the ontological bedrock – our concept of objectivity betrays signs of a complicated and contingent history, much as the layering of potsherds, marble ruins, and rusted cars would bespeak the same in an archeological site.

This paper is meant as a modest contribution to that still nascent history. Insofar as objectivity has been a theme in recent science studies, it is questions of existence and legitimacy that have exercised discussants, rather than those of history. Neither the question of whether objectivity exists or not (and if it exists, which disciplines have it), nor that of whether it is a good or bad thing (the theme of some recent feminist literature),¹ will concern me here. All sides of these several debates have largely assumed that objectivity is and has been a monolithic and immutable concept, at least since the seventeenth century. So pervasive and apparently persuasive is this assumption that it is rarely even uttered. Those few works which mention objectivity and history in the same breath examine how various sciences – mechanics, optics, chemistry, biology – successively cross the threshold of objectivity at specific historical junctures, but the implication is that objectivity itself has no history.² Among philosophers, those who have written analytically about objectivity recognize (or exemplify) the conceptual fault lines that sunder its various meanings, but all nevertheless treat it as a trans-historical given.³ Few of these recent studies, even those most directly concerned with objectivity in the sciences or with the historical context in which objectivity allegedly emerged once and for all, seriously entertain the hypothesis that objectivity might have an ongoing history intimately linked to the history of scientific practices and ideals. Insofar as objectivity has a history for these writers, be they old-fashioned progressivists or new-fangled feminists, it has a birthday (usually a Cartesian one, either 1637 or 1644), when it allegedly arrives on the scene full-grown and in full armour, like Athena from the head of Zeus.

In the face of such widespread conviction to the contrary, it would be natural to ask what grounds we have to believe that objectivity in the sciences *does* have a history. The conceptual layers I mentioned

are a clue to that history, but concrete examples are needed to make the claim interesting as well as plausible. In what follows I shall sketch one episode in the history of objectivity – namely, the ascendance of the ideal of what I will call ‘aperspectival objectivity’ in nineteenth-century science.

Aperspectival objectivity has been praised as ‘a method of understanding. . . . A view or form of thought is more objective than another if it relies less on the specifics of the individual’s makeup and position in the world, or on the character of the particular type of creature he is’;⁴ it has also been blamed for

rul[ing] out . . . perception which can fool us; the body, which has its frailties; society, which has its pressures and special interests; memories, which can fade; mental images, which can differ from person to person; and imagination – especially metaphor and metonymy – which cannot fit the objectively given external world.⁵

Although aperspectival objectivity is only one component of our layered concept of objectivity, and a relatively recent one at that, it dominates current usage. Indeed, it is difficult for us to talk about objectivity without enlisting the metaphor of perspective or variants such as ‘point of view’, ‘centreless’, ‘stepping back’, ‘climb[ing] outside of our own minds’, or Thomas Nagel’s brilliant oxymoron ‘view from nowhere’. Aperspectival objectivity is both conceptually and, as I hope to show, historically distinct from the ontological aspect of objectivity that pursues the ultimate structure of reality, and from the mechanical aspect of objectivity that forbids judgement and interpretation in reporting and picturing scientific results.⁶ Whereas ontological objectivity is about the world, and mechanical objectivity is about suppressing the universal human propensity to judge and to aestheticize, aperspectival objectivity is about eliminating individual (or occasionally group, as in the case of national styles or anthropomorphism) idiosyncracies. Although all these idiosyncracies came to be tarred with the same brush of subjectivity in the nineteenth century, they are by no means always handicaps: the ability to detect a faintly luminescent substance with the naked eye is as much an idiosyncrasy as a sluggish reaction time. Like all aspects of the current notion of objectivity, a perspectival objectivity is nowadays first and foremost associated with the natural sciences: both its possibility and desirability have been controversial in the social sciences since the turn of this century; and, in much of the recent philosophical literature, its very absence has been thought to be the hallmark of ethics.⁷

This was not always the case. I shall argue that aperspectival objectivity first made its appearance, not in the natural sciences, but rather in the moral and aesthetic philosophy of the latter half of the eighteenth century. Not only did it not figure prominently in the creed of natural scientists of this period; its enforcement would have been incompatible with the regimen of skill and hierarchy that then dictated scientific practice. Only in the middle decades of the nineteenth century was aperspectival objectivity imported and naturalized into the ethos of the natural sciences, as a result of a reorganization of scientific life that multiplied professional contacts at every level, from the international commission to the well-staffed laboratory. Aperspectival objectivity became a scientific value when science came to consist in large part of communications that crossed boundaries of nationality, training and skill. Indeed, the essence of aperspectival objectivity is communicability, narrowing the range of genuine knowledge to coincide with that of public knowledge. In the extreme case, aperspectival objectivity may even sacrifice deeper or more accurate knowledge to the demands of communicability.

My argument in support of these claims has four parts. I first give a very brief overview of the meanings of objectivity in the late eighteenth and early nineteenth centuries, in order to establish that what I have called aperspectival objectivity was not among them. I then examine the moral and aesthetic writings of Shaftesbury, Hume and Adam Smith, where, *inter alia*, the concept is most fully developed. From there, I address the situation in the natural sciences, contrasting the nineteenth-century attempts to eliminate all traces of the personal with earlier practices. Finally, I conclude with some thoughts about how and why a perspectival objectivity took on moral overtones.

What Objectivity Meant

The terms 'objective' and 'subjective' were native to scholastic philosophy, where they signified something quite different from what they do now: 'objective' pertained chiefly to objects of thought, rather than those of the external world. These terms were of ontological, not epistemological import in late medieval discussions of universals, and were flavoured with a strong Augustinian aftertaste: truly real objects were ideas in the divine mind.⁸ Traces of the scholastic meaning of objectivity can be found in Descartes, who wrote of degrees of 'objective reality' contained by various ideas,⁹ and indeed in many

eighteenth-century philosophical sources, at least in English and German. In French, *objectif* long vied with *positif* for approximately the same semantic territory; in the eighteenth century, the primary definition of *objectif* was that part of a microscope bearing the cognate name in English, with a secondary, ontological definition roughly denoting 'degrees of intrinsic (as opposed to "formal" or actual) reality'.¹⁰

All of these medieval and early modern usages pertain to the word 'objectivity', its variants and cognates, and these do not necessarily coincide with practices and ideals that we would now recognize as part of (or at least akin to) our conception of objectivity. For example, the codes of impartiality and disinterestedness developed by jurists in this period clearly capture some of the connotations of objectivity in our sense,¹¹ although these were not yet coupled with the word 'objectivity'. Moreover, as Peter Dear shows, some of these legal notions, along with legal procedures for the evaluation of testimony, were imported into early modern natural philosophy.¹² Yet it is still of importance to know when and how word and thing intersected, for the choice of which word to attach to which thing is never arbitrary. When, sometime around the turn of the nineteenth century, the word 'objectivity' absorbed the juristic meanings of impartiality along with the philosophical associations of external physical objects, it did not lose its more ancient ontological penumbra. It is this slow process of accretion and absorption that accounts for the layered structure of the notion of objectivity, and it is the historian's problem to explain when and how it became possible to lodge such originally disparate meanings and associations under the same linguistic roof. This is why the history of objectivity must shuttle back and forth between word and thing, attending to both. A history of the word without the thing risks degenerating into etymology; a history of the thing without the word risks anachronism.

A few eighteenth- and early nineteenth-century philosophical texts (the word, if not the thing, being the near exclusive possession of philosophers and theologians during this period) will serve to illustrate the ontological import of the term. In 1744, Bishop Berkeley could still invoke the scholastic senses of the word without paradox or redundancy: 'Natural phenomena are only natural appearances. They are, therefore, such as we see and perceive them: Their real and objective natures are, therefore, the same';¹³ here, 'objective' means what is perceived, and is in principle distinguishable from the 'real'. But C.A. Crusius, writing in 1747, registers a shift in meaning closer

to the modern sense, all the while preserving the older, theological overtones:

One divides the truth into the objective or metaphysical [*objektivische oder metaphysische*], which is nothing other than the reality or possibility of the object itself . . . [a]nd into the subjective or logicalistic [*subjektivische oder logikalische*], which is the truth in a really existing mind. . . . All objective truth is thus in the divine mind a subjective truth.¹⁴

Here is a recognizable variant of our outside/inside version of the objective/subjective distinction, at least where mortal minds are concerned.

These are citations taken more or less at random, and they witness rather than fix the meanings of the word 'objectivity' during this period. It is Kant who appropriated the old scholastic derivative *objektiv* as a technical term and gave it a new lease on life as a key concept in philosophy, albeit a concept that still differs significantly from our own. Kant's 'objective validity' (*objektive Gültigkeit*) pertains not to external objects *in se*, but rather to the relational categories (such as time, space and causality) which are the preconditions of experience.¹⁵ For our purposes, Kant's own use of the term is less important than its adoption and adaptation by less nice-minded followers, such as Samuel Taylor Coleridge. It was Coleridge who seems to have re-introduced the term into English philosophical usage in 1817, and it was his creative misunderstanding of Kant that crystallized an opposition of objective and subjective which we can at last readily recognize if not wholly embrace:

Now the sum of all that is merely OBJECTIVE we will henceforth call NATURE, confining the term to its passive and material sense, as comprising all the phenomena by which its existence is made known to us. On the other hand the sum of all that is SUBJECTIVE, we may comprehend in the name SELF or INTELLIGENCE. Both conceptions are in necessary antithesis. Intelligence is conceived of as exclusively representative, nature as exclusively represented; the one conscious, the other as without consciousness.¹⁶

This gallop through the eighteenth- and early nineteenth-century usage of the word 'objectivity' and its variants in English, French and German (all deriving and then diverging from the Latin terminology of scholasticism) is intended to make three points. First, 'objectivity' concerned ontology, and, post-Kant, to some measure epistemology in a transcendental vein. It had little or nothing to do with emotional detachment, restraint from judgement, method and measurement, or

empirical reliability. Second, its inseparable opposite, subjectivity in the sense of the mental, had yet to become a matter for regret or reproach. On the contrary: Coleridge branded our instinctive belief in the existence of things independent of us a 'prejudice', and thought '[t]he highest perfection of natural philosophy would consist in the perfect spiritualization of the laws of nature into the laws of intuition and intellect'.¹⁷ Third, the perspectival metaphor that so permeates our discussions of objectivity is (so to speak) nowhere on view.¹⁸

Perspectival Flexibility

This is not to say that perspectivity and its entourage of metaphors were wholly absent from philosophical discussions during this period – only that they were not yet attached to objects, that is, to the scientific and philosophical problems of describing and understanding the natural world. Rather, the divergence, integration and transcendence of individual perspectives were the province of moral philosophy and aesthetics. (The most notable exception is Leibniz's thoroughly perspectival metaphysics of the *Monadologie* [1714], but this remains an isolated case.) Here the problem of reconciling individual viewpoints on the same issue emerges full-blown, with the full complement of virtues we now attribute to objectivity (but not yet attached to that term): detachment, impartiality, disinterestedness, even self-effacement – all are enlisted to make shared, public knowledge possible. However, the issues that demand these virtues are not measurements of a cometary position or chemical observations, but rather the dramatic merit of a Roman comedy or the probity of accepting undeserved praise. Eighteenth- and nineteenth-century discussions of perspectivity agree in both their means (de-individualization, emotional distance) and ends (universal knowledge of one sort or another), but they treat very different objects: moral and aesthetic claims on the one hand, and scientific claims on the other.

Given the constraints of time and space, a few examples drawn from the eighteenth-century moral and aesthetic literature must suffice to make this contrast vivid. All those who maintained the existence of universal standards of the beautiful, such as Shaftesbury and Hume, had recourse to the language of individual perspective and critical self-effacement. Consider Hume's advice on judging works of art:

In like manner, when any work is addressed to the public, though I should have a friendship or enmity with the author, I must depart from this situation, and, considering myself as a man in general, forget, if possible, my individual being, and my peculiar circumstances. A person influenced by prejudice complies not with this condition, but obstinately maintains his natural position, without placing himself in that point of view which the performance supposes. . . . By this means his sentiments are perverted; nor have the same beauties and blemishes the same influence upon him, as if he had imposed a proper violence on his imagination, and had forgotten himself for a moment. So far his taste evidently departs from the true standard, and of consequence loses all credit and authority.¹⁹

Here are almost all the familiar elements of aperspectival objectivity: the peculiarities of an individual's 'natural position' must be subdued by 'forgetting' one's self in order to attain 'the true standard'. But the true standard here is that of 'catholic and universal beauty', not that of material nature.

Hume's aesthetic version of aperspectival objectivity also departs from the later scientific sort in one other important particular: Hume recommends that the critic cultivate perspectival suppleness, the ability to assume myriad other points of view, rather than the total escape from perspective implied by the 'view from nowhere'. However, the step from such empathic virtuosity to detached objectivity was a short one, and did not require abandoning the human for the natural domain. Adam Smith's *Theory of Moral Sentiments* (1759) proceeds in incremental steps from the psychological tugs and pulls of sympathy, which transplant us at least partly into the minds and hearts of our fellows, to the more exalted demands of an idealized impartiality that transcends all particular viewpoints. The first promptings of a moral sense come from the irresistible and reciprocal sympathy that stirs the spectator to feel some of the anguish of the sufferer, and the sufferer to approximate the cool indifference of the spectator. However, the psychological averaging of sympathy between sufferer and spectator may suffice to produce social concord, but not a full-blown morality of duty and justice. Sympathy alone inflames only the desire for praise; a sense of duty and justice impels us further to the higher desire to be praiseworthy. The one works only under conditions of sociability and social surveillance; the other scrutinizes intentions as well as actions, and requires self-policing. Although the attentive reader may find a gap of argumentation between Smith's psychology of the impartial spectator and his deontology of the 'man-within-the-breast', Smith himself apparently saw only a continuum. There is a progressive escalation of the adjectives deployed to describe the impartial spectator that

gradually lift him above any concrete identity, ascending from the 'indifferent bystander' to the 'great judge and arbiter'. Using the designations almost interchangeably, Smith transformed the flesh-and-blood 'impartial spectator', who sympathetically assumes any and all viewpoints, into the disembodied 'man-within-the breast', who rises above all particular viewpoints. The perspectival language is Smith's own:

In the same manner, to the selfish and original passions of human nature, the loss or gain of a very small interest of our own, appears to be of vastly more importance, excites a much more passionate joy or sorrow, a much more ardent desire or aversion, than the greatest concern of another with whom we have no particular connexion. His interests, as long as they are surveyed from this station, can never be put into the balance of our own. . . . Before we can make any proper comparison of those opposite interests, we must change our position. We must view them, neither from our own place nor from his, neither with our own eyes nor with his, but from the place and with the eyes of a third person, who has no particular connexion to either, and who judges with impartiality, between us.²⁰

As in Hume's aesthetics, Smith blames deviation from the 'true' moral standard on the prejudices of an unsuitable perspective, self-interest being at once the worst and most common of these perspectival distortions. In this context, scientists were held to be exemplary by the eighteenth-century perspectival philosophers, but not because science was presumed free of particular perspectives – that is, 'objective' in our latter-day sense. Rather, scientists were revered as paragons of the virtue of disinterestedness, both in the immediate sense of forsaking the motives of selfish gain, and in the more remote sense of remaining serene in the face of public apathy or contempt. Shaftesbury took the contemplative joy of the mathematician as the paradigm for all moral and aesthetic impulses that abandoned 'private interest' and 'self-good';²¹ Adam Smith admired the indifference of the mathematician and natural philosopher to adverse public opinion as akin to the indifference of a wise man unjustly condemned for actions he himself knows to have conformed to the 'exact rules of perfect propriety'. In contrast to the endless bickering and intriguing of poets to prop up their reputations, Smith believed mathematicians and natural philosophers to be 'almost always men of the most amiable simplicity of manners who live in good harmony with one another'.²² Smith's sanguine view of the character of savants was based on an overly credulous reading of the academic éloges of Fontenelle,²³ and was at times ludicrously inaccurate, as when he surmised that Newton had been so nonchalant

about the public reception of the *Principia* that his 'tranquillity . . . never suffered, upon that account, the interruption of a single quarter of an hour'.²⁴ However, for our purposes, the accuracy of this image of the disinterested scientist is less important than its widespread currency and its putative grounds. Mathematicians and, to a lesser extent, natural philosophers were allegedly disinterested because indifferent to public opinion, and they were indifferent because the certainty or near-certainty of their 'demonstrations' freed them from evaluations based only on 'a certain nicety of taste'. Thus, it was not so much the universality or physical materiality of scientific subject matter as the certainty of scientific arguments (even if evident initially only to their authors) that guaranteed scientists a certain enviable detachment in the eyes of the moral philosophers.

However, disinterestedness was hardly full-fledged aperspectival objectivity. As we have seen, the latter concept was not unknown to eighteenth-century thinkers, but its native soil was aesthetics and, especially, moral philosophy, not the natural sciences. It is in this moral realm, rather than in that of ontological objectivity, that the subjective – or the 'private', as it was usually and more revealingly called – acquired an unsavoury odour. Kant could use the 'subjective' and the 'empirical', both belittled by a prefatory 'merely', as near-synonyms in his treatment of duty, so remote was his moral conception of objectivity from the natural sciences. Yet there is an emblematic if uncharacteristic passage in Kant's first *Kritik* that heralds this shift in the meaning of objectivity towards public knowledge. Distinguishing between 'objective grounds' for and 'subjective causes' of belief, Kant linked the truth of an idea ('agreement with object') to the communicability of the idea: 'The touchstone of belief [*Fürwahrhalten*], whether it is [objective] conviction or merely [subjective] persuasion, is thus, externally, the possibility of communicating it', for communicability is made possible both by the shared rationality of minds, and the shared object to which the idea refers. Kant was careful to point out that communicability by itself was only a 'subjective means' to overcome the privacy of one's judgement, and did not suffice to create full, 'objective' persuasion.²⁵ Nevertheless, Kant's combination of the ontological meaning of a shared object, the epistemological meaning of shared reason, and the social meaning of shared information under the rubric of the 'objective', invited a blurring of these distinctions, and proved prophetic of things to come. By the latter half of the nineteenth century, aperspectival objectivity had displaced (though not entirely replaced)

ontological objectivity in philosophical discourse, and the natural sciences were touted as its fullest realization.

Aperspectival Objectivity as Scientific Objectivity

The various kinds of objectivity might be classified by the different subjectivities they oppose. By the mid-nineteenth century, ontological objectivity had come to oppose consciousness *per se*, and mechanical objectivity opposed interpretation.²⁶ The aperspectival objectivity attributed to late nineteenth-century science opposed the subjectivity of individual idiosyncracies, which substituted for the individual interests and 'situations' analyzed by the eighteenth-century moral perspectivists. Just as the transcendence of individual viewpoints in deliberation and action seemed a precondition for a just and harmonious society to eighteenth-century moralists, so the transcendence of the same in science seemed to some nineteenth-century philosophers a precondition for a coherent scientific community. The existence of such a community, stretching over time and space, in turn seemed a precondition for – or even an eventual guarantee of – reaching scientific truth.

Charles Sanders Peirce conceived of this necessarily communal form of truth-seeking as proceeding by a kind of symmetric cancellation of individual errors:

The individual may not live to reach the truth; there is a residuum of error in every individual's opinions. No matter, it remains that there is a definite opinion to which the mind of man is, on the whole and in the long run, tending . . . This final opinion, then, is independent, not indeed of thought in general, but of all that is arbitrary or individual in thought; it is quite independent of how you, or I, or any number of men think.

The objectively real is not that which eliminates the mental, but that which eliminates individual idiosyncrasy through the prolonged 'averaging' of viewpoints by communication.²⁷ Scientific communication also lies near the heart of Gottlob Frege's conception of objectivity, his reputation as a metaphysical Platonist notwithstanding. Frege objected to a psychological treatment of logic because it would make scientific communication impossible: 'Thus, I can also acknowledge thoughts as independent of me. Other men can grasp as much as I: I can acknowledge a science in which many can be engaged in research'.²⁸

Peirce and Frege bear philosophical witness to changes in scientific practices that wrought corresponding changes in scientific ideals during the middle decades of the nineteenth century. The scale and organization of scientific labour grew and became more complex: more people with more diverse training were in more frequent contact than ever before. Science had been collaborative, at least in principle, since the seventeenth century,²⁹ and cosmopolitanism was the leit-motif of Enlightenment science.³⁰ But the scientific province of the eighteenth-century Republic of Letters was not yet a scientific community in the modern sense: academies may have exchanged proceedings, and there were international collaborations like that which observed the transit of Venus in 1761, but the real communicative bonds were friendships (or enmities) between individual scientists, nourished by lifelong correspondences. These were highly selective bonds established between peers, and even if the relationship never progressed from pen-pals to face-to-face meetings, the correspondences often waxed from cordial to intimate, with personal revelations strewn among scientific findings.³¹ In contrast, the contacts that knit together the nineteenth-century scientific world were at once more numerous, more heterogeneous, and more impersonal, although they never entirely displaced scientific friendships. For all the cosy *Gemeinschaft* associations of the term 'scientific community', the actual relationships that welded it together were increasingly narrow and formal.

But welded together it was, not only by invisible girders that stretched across national and linguistic boundaries in the form of international journals, commissions, and congresses, but also by the filaments that criss-crossed levels of skill, status and training within and among laboratories and observing stations. Articles circulated across oceans and continents, measurements were exchanged, observations tallied, instruments calibrated, units and categories standardized. This bustle of scientific communication was in part made possible by better postal systems, railways, telegraphs, and the like, but it was not caused by these technologies. Nor was it simply the inevitable result of nature's uniformity, enabling many scattered observers to compare notes on universal phenomena. There was nothing inevitable about communicative science; it required hard work at every juncture: new instruments and new methods of data analysis were a precondition for amalgamating measurements made by far-flung observers;³² international commissions met and wrangled over the standards and definitions that would make the result of, say,

statistical or electrical research comparable;³³ scientific labour had to be divided and disciplined to equalize differences of skill and training.³⁴ The very phenomena had to be pruned and filtered, for some were too variable or capricious to travel well. Already in the eighteenth century, scientists had begun to edit their facts in the name of scientific sociability;³⁵ by the mid-nineteenth century, the contraction of nature to the communicable had become standard practice among scientists. It would be an exaggeration, but not a distortion, to claim that it was scientific communication that was the precondition for the uniformity of nature rather than the reverse.

This is the context in which aperspectival objectivity became the creed of scientists, the ideal that corresponded to the practice of well-nigh constant, impersonal communication. As Theodore Porter has argued, certain forms of quantification have come to be allied with objectivity not because they necessarily mirror reality more accurately, but because they serve the ideal of communicability, especially across barriers of distance and distrust.³⁶ Aperspectival objectivity was the ethos of the interchangeable and therefore featureless observer – unmarked by nationality, by sensory dullness or acuity, by training or tradition; by quirky apparatus, by colourful writing style, or by any other idiosyncrasy that might interfere with the communication, comparison and accumulation of results. Scientists paid homage to this ideal by contrasting the individualism of the artist with the self-effacing cooperation of scientists, who no longer came in the singular – ‘l’art c’est moi, la science, c’est nous’, in Claude Bernard’s epigram. Ernest Renan favoured the ‘more objective word *savoir*’, in which ‘one is transported to the viewpoint of humanity’, over *philosopher*, which conjured up ‘the subjective fact of the solitary thinker’;³⁷ it became good form among scientists to write studiously impersonal autobiographies, as in the cases of Darwin and Huxley.³⁸ Subjectivity became synonymous with the individual and solitude; objectivity, with the collective and conviviality.³⁹ The ethos of aperspectival objectivity had arrived.

In order to appreciate the novelty of this ethos in science, we must contrast it with the ideals and practices that preceded it. Differences of perspective, literal and figurative, were often remarked upon by natural philosophers of an earlier period. Leeuwenhoek, for example, wrote to the Royal Society of London that he and his artist had disagreed about the size of some ‘Flesh-fibres of a Whale’ observed under the microscope, and provided drawings illustrating both his and the artist’s view, ‘whence appears the difference of one Man’s

sight from another'.⁴⁰ Disagreements between scientists and artists about what was seen and how to draw it were commonplace in the sciences of the eye,⁴¹ and were a special case of the even more widespread distinction between competent and incompetent observers. Far from embracing the ideal of the interchangeable observer, seventeenth- and eighteenth-century scientists carefully weighted observation reports by the skill and integrity of the observer. Edmund Halley complained that many astronomical 'meteors' 'escape the Eyes of those that are best qualified to give a good Account of them', and was scrupulous in evaluating the quality of his own and others' observations of a solar eclipse.⁴² Reports of scientific findings, particularly in the empirical sciences but sometimes even in mathematics, were emphatically cast in the first-person singular, for the skill and character (and occasionally social status) of the reporter were often as crucial to judging its worth as its contents.⁴³ Scientific correspondents may have not known one another personally in all cases, but they probed each other's abilities and trustworthiness with the same thoroughness and care they would have applied to the credentials of a banker about to be entrusted with a large sum of money. Even the testimony of nature could not always trump the testimony of a trusted colleague: when the Paris Académie des Sciences failed to replicate Johann Bernoulli's glowing barometers, even after repeated trials that followed Bernoulli's instructions to the letter, Perpetual Secretary Fontenelle preferred to appeal to the '*bisarrerie*' of nature than to doubt so eminent a witness's word.⁴⁴ Conversely, stacks of corroborative reports failed to move the Académie when the witnesses had low credibility in its eyes – for example, illiterate peasants observing meteorite falls.⁴⁵

Seen against this background, we can better appreciate why *aperspectival* objectivity did not figure prominently in eighteenth-century science. Impersonal communication and a refined division of scientific labour were the exception rather than the rule, and the ideal of the interchangeable observer would have exercised little attraction for observers proud of their own hard-won qualifications and alert to minute differences in the qualifications of others. We can also appreciate the high cost of the ideal of *aperspectival* objectivity, and of the practices that eventually established it in the natural sciences. Nineteenth-century scientists still sometimes complained about the anonymity of international journals in terms their eighteenth-century predecessors would have well understood; for example, in 1881 *The Lancet* reminded editors of their responsibility to 'a certain number of

readers, and especially those in foreign countries, [who] have no clue to the character of the author beyond the fact that they find his works in good company' in screening articles by contributors locally known to be 'constitutionally incapable of telling the simple, literal truth as to their observations and experiments'.⁴⁶ The distances and sheer numbers of writers and readers spanned by the new networks of scientific communication had undermined the old rules of trust and trustworthiness.

However, the principal casualty of the ideal and practices of a perspective objectivity was not trust but skill. Skill did not fit comfortably into the enlarged, collective science of the latter half of the nineteenth century, for at least two reasons: first, it was rare and expensive and therefore could not be expected of all scientific workers; and second, it could be communicated at best with difficulty, if at all. As science expanded in the middle decades, so did its need for labour, preferably cheap labour. However, cheap labour was usually badly educated labour (with the notable exception of scientists' wives and sisters),⁴⁷ and Charles Babbage suggested that scientists follow the example of manufacturers in dividing tasks into their smallest, simplest parts to minimize the necessary scientific qualifications. Recounting how the French mathematician Prony had farmed out the computation of his logarithm tables to reckoners who could only add and subtract, Babbage pointed out that since this labour 'may almost be termed mechanical, requiring the least knowledge and by far the greatest exertions', it 'can always be purchased at an easy rate'.⁴⁸ Babbage touted the accuracy of Prony's human computers, and Claude Bernard thought 'an uneducated man' would be a less biased recorder of experimental results,⁴⁹ but there can be little doubt that the division of scientific labour altered the nature and distribution of scientific skill. The interchangeable observer was all too often the lowest common denominator observer. As Babbage himself remarked with characteristic crispness,

genius marks its tract, not by the observation of quantities inappreciable to any but the acutest senses, but by placing nature in such circumstances, that she is forced to record her minutest variations on so magnified a scale, that an observer, possessing ordinary faculties, shall find them legibly written.⁵⁰

In short, skill was too aristocratic a trait for a democracy of scientific observers, where democracy carries the Tocquevillean associations of mediocrity.

Skill was also notoriously ineffable, as Zeno Swijtink has pointed

out,⁵¹ and therefore increasingly suspect among scientists who equated objectivity with communicability. Georges Cuvier expressed some of this discomfort in his *éloges* of physicians celebrated for their clinical tact, for the causes of their cures were inscrutable to all who were unable to 'penetrate to [the physician's] most intimate thoughts . . . or be present at his sudden inspirations'.⁵² This discomfort had become acute by the time the physiologist Etienne Jules-Marey launched his campaign to replace the human senses with recording instruments. The advantage of, for example, the sphygmometer over the human pulse reader was not only that it levelled individual differences in sensory sharpness and clinical tact – a relative green-horn (or a low-paid technician or nurse) could fill in for the experienced physiologist or doctor. It was also that the sphygmometer and other self-inscribing instruments could convey results which language could not. What good was the exquisite skill of the practised pulse reader to science, queried Marey, if he could not communicate it: 'How can he hope, by definitions or metaphors, to make the nature of a tactile sensation comprehensible [to others]?'⁵³ The problems of communicating skill and judgement acquired through long experience were not peculiar to medicine; astronomers and other observers also increasingly turned to statistical methods, the more mechanical the better, to standardize their results in a form immediately accessible to others.⁵⁴ The net result was often a loss of valuable information that had previously been an integral part of the observation report – whether the observer was suffering from a head cold, whether the telescope was wobbly, whether the air was choppy – but information too particular to person and place to conform to the strictures of *aperspectival* objectivity.

Conclusion: The Moral History of Objectivity

I hope I have by now made at least four points clear concerning the history of *aperspectival* objectivity: first, that it does not constitute the whole of objectivity, and that its relationships with other aspects of objectivity (for example, the ontological) are conceptually and historically problematic; second, that its first conceptual home was in aesthetics and moral philosophy, not the natural sciences, despite our current associations; third, that when it did emigrate to science in the mid-nineteenth century, it did so because of vast changes in the organization of science, both at a global and local level; and fourth,

that the adoption of aperspectival objectivity as a scientific ideal was not without its costs. I have left many questions unanswered, chief among them how aperspectival objectivity came to be fused with the other meanings of objectivity into a single, if conglomerate concept. Why, for example, should public knowledge – observations most easily communicated to and replicated by as many people as possible – lay metaphysical claim to being the closest approximation of the real? These are knotty problems that would require a paper at least twice as long as this one; the best I can do here is to flag them as problems.

I would like to conclude with a reflection about the moral import of aperspectival objectivity. No one familiar with its past and present literature can overlook its admonishing, admiring tone. For these authors, there is a certain nobility in the abandonment of the personal, a sacrifice of the self for the collective – if not for the collective good, at least for the collective comprehension. It should be noted that these are entirely different grounds for moral applause than those of Adam Smith and the eighteenth-century moral philosophers, although the same terms ‘detachment’ and ‘impartiality’ are often invoked. Smith, it will be remembered, credited scientists and mathematicians with a certain admirable indifference to public opinion: secure in the knowledge that their work would ultimately be estimated at its true worth, they were immune to the vagaries of contemporary criticism. The detachment required of scientists by aperspectival objectivity was considerably more strenuous: scientists must not only wait to be recognized; they must now give up recognition altogether. Ernest Renan captured the self-denying import of aperspectival objectivity:

[The scientist’s] goal is not to be read, but to insert one stone in the great edifice . . . the life of the scientist can be summarized in two or three results, whose expression will occupy but a few lines or disappear completely in more advanced formulations.⁵⁹

Claude Bernard exhorted scientists to bury their pride and vanity in order ‘to unite our efforts, instead of dividing them or nullifying them by personal disputes’,⁶⁰ for all scientists are ultimately equal in their anonymity:

In this fusion [of particular truths into general truths], the names of promoters of science disappear little by little, and the further science advances, the more it takes an impersonal form and detaches itself from the past.⁶¹

There is no doubt that these and kindred statements bespeak a high-minded ideal rather than a sociological reality: scientists may have given up writing in the first person singular, but not signing their articles. There is also some justice in the accusation that in so burying their individual identities in the impersonal collectivity, scientists actually aggrandize rather than surrender their social and intellectual authority. But this is not the whole meaning of the self-denying demands of aperspectival objectivity. Even values honoured only in the breach are nevertheless genuine values, reflecting choices and revealing attitudes. Moreover, the values of aperspectival objectivity left visible traces in the conduct of scientists, in their ever stronger preference for mechanized observation and methods, in their ever more refined division of scientific labour, and in their ever more exclusive focus on the communicable. It would be difficult to explain the force of these values by appeal to either rationality or self-interest alone, and equally difficult to deny that aperspectival objectivity never shook off all traces of its origins in moral philosophy. In the self-denying counsels of aperspectival objectivity still reverberates the stern voice of moral duty, and it is from its moral character, not from its metaphysical validity, that much of its force derives. The values of perspectival objectivity are undeniably curious ones, and may well be of dubious merit. But moral values they undeniably are, and we must take this into account when we try to explain how our current confused usage of objectivity came to be. The history of objectivity is an intellectual and a social history, but it is a moral history as well.

• NOTES

This work was supported by US National Science Foundation Grant No. DIR-8911169. I would like to thank Peter Dear and Theodore Porter for comments on an earlier version of this paper.

1. See, for example, Susan Bordo, *The Flight to Objectivity: Essays on Cartesianism and Culture* (Albany, NY: State University of New York Press, 1987), and Evelyn Fox Keller, *Reflections on Gender and Science* (New Haven, CN: Yale University Press, 1985).

2. Here I am thinking especially of Charles C. Gillespie's classic *The Edge of Objectivity: An Essay in the History of Scientific Ideas* (Princeton, NJ: Princeton University Press, 1960), which is a history of when and how various sciences attained objectivity, rather than of objectivity itself.

3. See Karl Popper, *Objective Knowledge: An Evolutionary Approach* (Oxford: Oxford University Press, 1973); Richard Rorty, *Philosophy and the Mirror of Nature* (Princeton, NJ: Princeton University Press, 1979); Thomas Nagel, *The View from Nowhere* (Oxford: Oxford University Press, 1986); R.W. Newell, *Objectivity, Empiricism and Truth* (London: Routledge & Kegan Paul, 1986); and Helen E. Longino, *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry* (Princeton, NJ: Princeton University Press, 1990).

4. Nagel, *View*, op. cit. note 3, 4–5.

5. George Lakoff, *Women, Fire, and Dangerous Things: What Categories Reveal about the Mind* (Chicago, IL & London: The University of Chicago Press, 1987), 183.

6. On ontological objectivity in its modern form, see Newell, *Objectivity*, op. cit. note 3, 16–38; on mechanical objectivity, see Lorraine Daston and Peter Galison, 'The Image of Objectivity', forthcoming in *Representations*.

7. Concerning the social sciences, see Max Weber, 'Die "Objectivität" sozialwissenschaftlicher und sozialpolitischer Erkenntnis' (1904), in Johannes Winckelmann (ed.), *Gesammelte Aufsätze zur Wissenschaftslehre* (Tübingen: J.C.B. Mohr, 3rd edn, 1968), 146–214, and Robert Proctor, *Value-Free Science?* (Cambridge, MA: Harvard University Press, 1992); concerning ethics, see Bernard Williams, 'The Scientific and the Ethical', in S.C. Brown (ed.), *Objectivity and Cultural Divergence* (Cambridge: Cambridge University Press, 1984), 209–28. For a discussion of the resurgence of 'objective' ethics, see Samuel Scheffler, 'Objectivity', *London Review of Books*, Vol. 12, No. 7 (13 September 1990), 9–10.

8. For examples of the scholastic meanings, see the article 'Objective' in the *Oxford English Dictionary*; on Augustine's influence, see John F. Bowler, 'Intuitive and Abstract Cognition', in Norman Kretzmann, Anthony Kenny and Jan Pinborg (eds), *The Cambridge History of Later Medieval Philosophy* (Cambridge: Cambridge University Press, 1982), 460–78.

9. See, especially, Meditation III, in René Descartes, *Meditationes de prima philosophia* (1641); also Calvin Normore, 'Meaning and Objective Meaning: Descartes and His Sources', in Amelie Oksenberg Rorty (ed.), *Essays on Descartes' Meditations* (Berkeley, CA: University of California Press, 1986), 223–42, and Peter Dear's contribution to this Symposium, 'From Truth to Disinterestedness in the Seventeenth Century', *Social Studies of Science*, Vol. 22 (1992), 619–31.

10. See, for example, the article 'Objectif', *Dictionnaire de Trévoux* (Paris, 1762).

11. On the professional ethos of disinterestedness among lawyers, see Lucien Karpik, 'Le Désintéressement', *Annales: Economies, Sociétés, Civilisations*, Vol. 44 (mai–juin 1989), 733–51.

12. See Dear, op. cit. note 9; also Steven Shapin and Simon Schaffer, *Leviathan and the Air Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, NJ: Princeton University Press, 1985).

13. George Berkeley, *Siris* (1744), Section 292, quoted in the *OED* article 'Objective', op. cit. note 8.

14. C.A. Crusius, *Weg zur Zuverlässigkeit und Gewißheit der menschlichen Erkenntnis* (1747), in G. Tonelli (ed.), *Die philosophischen Hauptwerke* (Hildesheim: Georg Olms, 1965), Vol. 3, 95.

15. Immanuel Kant, *Kritik der reinen Vernunft* (1781, 1787), A201-02/B246-47 *et passim*: Kant uses the word *Gegenstand* to denote the reality of external objects (as opposed to the objectivity of conceptions of objects). See Henry E. Allison's *Kant's*

Transcendental Idealism (New Haven, CN & London: Yale University Press, 1983), 134–55, for a lucid discussion of the distinction.

16. Samuel Taylor Coleridge, *Biographia Literaria* (1817), ed. J. Shawcross, 2 Vols (Oxford: Oxford University Press, 1973), Vol. 1, 174.

17. *Ibid.*, 178, 175.

18. I realize that there exists a distinguished philosophical literature which attributes a form of aperspectival objectivity to Descartes: see, for example, Bernard Williams, *Descartes: The Project of Pure Enquiry* (Hassocks, Sussex: Harvester Press, 1978), 69–70; or Karsten Harries, 'Descartes, Perspective, and the Angelic Eye', *Yale French Studies*, No. 49 (1973), 28–42. I cannot here address these claims in the detail they deserve. However, I believe that they are the result of mistakenly collapsing the entire history of objectivity into a single moment, thus projecting current meanings and metaphors on to past usage. Here suffice it to remark that Descartes' epistemological worries concern the entire human species, not individuals, and that (in contrast to, say, Montaigne's discussions of morals and manners) the perspectival metaphor is rarely invoked.

19. David Hume, 'Of Standards of Taste', in *Philosophical Works*, 4 Vols (Edinburgh, 1826), Vol. 3, 271.

20. Adam Smith, *The Theory of Moral Sentiments* (1759), eds D.D. Raphael and A.L. Macfie (Oxford: Oxford University Press, 1976), 135.

21. Anthony, Earl of Shaftesbury, *Characteristics of Men, Manners, Opinions, Times, etc.* (1711), ed. John M. Robertson, 2 Vols (London, 1900), Vol. 1, 296.

22. Smith, *Moral Sentiments*, op. cit. note 20, 125.

23. On the motif of disinterestedness in the academic eulogues, see Charles B. Paul, *Science and Immortality: The Eulogies of the Paris Academy of Sciences (1699–1791)* (Berkeley, CA: University of California Press, 1980), and Dorinda Outram, 'The Language of Natural Power: The "Eulogies" of George Cuvier and the Public Language of Nineteenth-Century Science', *History of Science*, Vol. 16 (1978), 153–78. Concerning the importance of impartiality among enlightenment intellectuals, see Lorraine Daston, 'The Ideal and Reality of the Republic of Letters in the Enlightenment', *Science in Context*, Vol. 4 (1991), 367–86.

24. Smith, *Moral Sentiments*, op. cit. note 20, 124.

25. Kant, *Kritik*, op. cit. note 15, A820–22/B848–50.

26. See Daston & Galison, op. cit. note 6. The difference between perspectival and mechanical objectivity is brought into sharp focus by their contrasting responses to photography. The photograph is the emblem of mechanical objectivity, because it appears to be a direct transcription of nature, free of meddlesome human interference. But perspectival objectivity rejects the photograph, because it preserves '[t]he unfamiliar angle of vision, the seemingly random cropping, which . . . can be understood as ways of stressing the necessary presence of the distinctive perceiving subject, the peculiarly individual point of view': Charles Rosen and Henri Zerner, *Romanticism and Realism: The Mythology of Nineteenth-Century Art* (New York: Viking, 1984), 110.

27. Charles Sanders Peirce, 'A Critical Review of Berkeley's Idealism' (1871), in Philip Wiener (ed.), *Values in a Universe of Chance: Selected Writings of C.S. Peirce (1839–1914)* (New York: Dover, 1958), 81–83.

28. G. Frege, 'Thoughts', in Peter Geach (ed.), *Logical Investigations* (New Haven, CN: Yale University Press, 1977), 8–9; quoted in Thomas G. Ricketts, 'Objectivity and

Objecthood: Frege's Metaphysics of Judgment', in L. Haaparanta and J. Hintikka (eds), *Frege Synthesized* (Dordrecht: Reidel, 1986), 65–95.

29. See, for example, the rather typical views of Marin Mersenne on the necessity of scientific cooperation: *Questions inouyes ou Recréations des Sçavans* (Paris, 1634), Qu. 30.

30. On the rise and fall of Enlightenment scientific cosmopolitanism, see Daston, 'Ideal and Reality', op. cit. note 23, and Lorraine Daston, 'Scientific Neutrality and Nationalism under Napoleon', in T. Frängsmyr (ed.), *Solomon's House Revisited* (Canton, MA: Science History Publications, 1990), 95–119.

31. For example, the correspondence between the electricians Charles Dufay and Stephen Gray, or that between the naturalists A. Jussieu and Joseph Banks. On the absence of a scientific community in the eighteenth century, see Wolf Lepenies, *Between Science and Literature: The Rise of Sociology*, trans. R.J. Hollingdale (Cambridge: Cambridge University Press, 1988), 2.

32. Zeno J. Swijtink, 'The Objectification of Observation', in Lorenz Krüger et al. (eds), *The Probabilistic Revolution*, 2 Vols (Cambridge, MA: MIT Press, 1987), Vol. 1, 261–85.

33. On the standardization of statistical categories, see Alain Desrosieres and Laurent Thevenot, *Les Catégories socioprofessionnelles* (Paris: La Découverte, 1988); on electrical units, see Simon Schaffer, 'A Manufactory of Ohms: The Integrity of Victorian Values', paper presented to the UCLA History of Science Workshop (Fall 1989).

34. Simon Schaffer, 'Astronomers Mark Time', *Science in Context*, Vol. 2 (1988), 115–46.

35. Lorraine Daston, 'The Cold Light of Facts and the Facts of Cold Light: Luminescence and the Transformation of Scientific Fact, 1600–1750', paper presented to the UCLA History of Science Workshop (Winter 1990).

36. See Theodore M. Porter's contribution to this Symposium, 'Quantification and the Accounting Ideal in Science', *Social Studies of Science*, Vol. 22 (1992), 633–52; also Porter, 'Objectivity as Standardization: The Rhetoric of Impersonality in Measurement, Statistics, and Cost-Benefit Analysis', *Annals of Scholarship*, in press.

37. Ernest Renan, *L'Avenir de la Science* (Paris, 1890), 91.

38. Regenia Gagnier, *Subjectivities: A History of Self-Representation in Britain 1832–1920* (Oxford: Oxford University Press, 1990), Chapter 6.

39. On the tension between the ideals of solitude and conviviality, see Steven Shapin, 'The Mind in Its Own Place: Science and Solitude in Seventeenth-Century England', *Science in Context*, Vol. 4 (1991), 191–218.

40. A. van Leeuwenhoek [Letter of 12 October 1713], *Philosophical Transactions of the Royal Society of London* (reprinted New York: Johnson Reprint, 1963), Vol. 29 (1714–16), 55–56.

41. For other examples of attempts by scientists to police their artists, see Daston & Galison, 'Image', op. cit. note 6.

42. Edmund Halley, 'Observations of the Late Total Eclipse of the Sun . . .', *Philosophical Transactions*, Vol. 29 (1714–16), 245–62.

43. On the relationship between social status and trust in early modern English natural philosophy, see Steven Shapin, '"A Scholar and a Gentleman": The Problematic Identity of the Scientific Practitioner in Early Modern England', *History of Science*, Vol. 29 (1991), 279–327.

44. [Bernard de Fontenelle], 'Sur le phosphore du barometre', *Histoire de*

l'Académie Royale des Sciences: Année 1701 (Paris, 1743), 1–8. See Steven Shapin, 'O Henry', *Isis*, Vol. 78 (1987), 417–24, concerning the *de facto* impossibility of doubting a colleague's word.

45. Ron Westrum, 'Science and Social Intelligence about Anomalies: The Case of Meteorites', *Social Studies of Science*, Vol. 8 (1978), 461–93.

46. John S. Billing, 'Our Medical Literature', *The Lancet* (1881), Vol. 2, 265–70, at 270.

47. See Pnina Abir-Am and Dorinda Outram (eds), *Uneasy Careers and Intimate Lives: Women in Science, 1789–1979* (New Brunswick, NJ: Rutgers University Press, 1987), on this widespread and important form of scientific labour.

48. Charles Babbage, *On the Economy of Machinery and Manufactures* (London, 4th edn, 1835), 195. The mechanization of scientific work and the reproduction of scientific images also served the ideal of mechanical objectivity, by purportedly eliminating interpretation: see Daston & Galison, 'Image', op. cit. note 6.

49. Claude Bernard, *An Introduction to the Study of Experimental Medicine* (1865), trans. H.C. Greene (New York: Dover, 1957), 38.

50. Charles Babbage, *Reflections on the Decline of Science in England and on Some of its Causes* (1830), in Martin Campbell-Kelly (ed.), *The Works of Charles Babbage* (London: William Pickering, 1989), Vol. 7, 86.

51. See Swijtink, 'Objectification', op. cit. note 32. The best philosophical account of the 'tacit' quality of scientific skill is still Michael Polanyi, *Personal Knowledge* (Chicago, IL: The University of Chicago Press, 1958). On the social invisibility of manual skill and technicians in science, see Steven Shapin, 'The Invisible Technician', *American Scientist*, Vol. 77 (1989), 554–63.

52. Georges Cuvier, *Recueil des éloges historiques lus dans les séances publiques de l'Institut de France* (Paris, 1861), Vol. 3, 4.

53. E.J. Marey, *Physiologie médicale de la circulation du sang* (1863), quoted in François Dagognet, *Etienne-Jules Marey: La Passion de la trace* (Paris: Hazen, 1987), 87.

54. See Swijtink, 'Objectification', op. cit. note 32, concerning the statistical treatment of outliers, and Desrosières & Thevenot, *Catégories*, op. cit. note 33, on the subtleties of statistical coding.

55. Renan, *Avenir*, op. cit. note 37, 228.

56. Bernard, *Introduction*, op. cit. note 49, 39.

57. *Ibid.*, 42.

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