

IV.—THE USE AND ABUSE OF FINAL CAUSES.

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IN preaching the gospel of natural science Bacon told us "Natura non nisi parendo vincitur". From another point of view Kant replied—"The understanding makes Nature, but does not create it". Both sayings contain great truth; but at most they are only half truths. Scientific discovery is as impossible without scientific imagination as it is without scientific observation. Man can only find what he seeks; yet what he finds is there already. Countless men had seen apples fall to the ground before Newton; and yet Newton alone discovered the law of gravitation. Many a photographer had found his plates spoilt by the X-rays before Röntgen; and yet Röntgen alone discovered the significance of their marks. Nature keeps her secrets well and can be forced to divulge them only by the most strenuous efforts on the part of man, *natura minister et interpretes*; and the only key with which he can unlock them is himself, his own ideas, his own interests, his own intellect, his own will: and his experience reveals to him not only that Nature is intelligible—more or less—to his intelligence, but pliable to his practical interests, if he but use the proper means. The gulf betwixt him and Nature he finds to be not absolute, but bridgeable by many chains of his own forging. Puny man cannot resist the force of the ocean storm or the fire of the active volcano, but he can use the wind to waft his ships over the sea, and the fire to cook his food or drive his engines. He is at once the victim and the master of Nature, the child and the maker of Nature. He not only discovers the truth of his ideas by observing their agreement with the facts of Nature, but he finds that they work out into practical results. He can never separate theory and practice: without theory no practice, without practice no theory. "Scientia et potentia,"¹ says Bacon, "in idem coincidunt, quia ignorantio causæ destituit

¹ N. O., i., 3.

effectum," and in another passage¹ he quotes with approval the Aristotelian maxim "Vere scire est per causas scire," and the Aristotelian distinction of four causes, *Materia, Forma, Efficiens, et Finis*: and then follows his famous condemnation of final causes: "ex his causa finalis tantum abest ut prosit, ut etiam scientias corrumpat, nisi in hominis actionibus"—a condemnation reinforced afterwards by Spinoza and under certain limitations sanctioned by Kant, who in his *Kritik of Judgment* has done more than any other philosopher since Aristotle to put the doctrine of final causes on its proper basis—with what success will be considered later.

To clear the ground however let us first consider what exactly Bacon meant, and then why Spinoza was so peculiarly opposed to final cause from any point of view. This done, Kant will enable us to see how far the idea of final cause can safely be used in scientific investigation and in philosophy—what is its use and what its abuse. And then perhaps we shall be in a position to carry his statements a little farther, and frame a more modern doctrine of our own—in spite of Mr. Bradley's warning² that "this question of the operation of Ends in Nature is one which, in my judgment, metaphysics should leave untouched".

The passages in the *De Augmentis Scientiarum*, where Bacon deals with final causes, are so often forgotten or misunderstood that it will be well to examine them with some detail. These passages occur³ when he is speaking of Natural Philosophy, not of the *Doctrina de Homine*; as a matter of fact in the later portion of the treatise, where he deals with man, he never alludes to final causes, although, as we have seen in the *Novum Organum*, he had approved their use "in hominis actionibus". *Philosophia Naturalis* Bacon subdivides into *Speculativa*, which is concerned with the investigation of causes; and *Operativa*, which issues in the production of effects. This *Speculativa* he again divides into *Physica*, which investigates material and efficient causes; and *Metaphysica* (*purgato nomine*), which investigates formal and final causes.

Hence has arisen the first misunderstanding of Bacon's meaning. For his readers have often forgotten that his own favourite "forms"—not indeed "abstractæ," but "in materia determinatæ"—he also puts under *Metaphysica* (*purgato nomine*), and have only remembered that he relegates final causes to *Metaphysics*—to what they take to mean, his limbo for useless notions: whereas in this context he really means by the term *Metaphysica* what the modern

¹ *N. O.*, ii., 2.² *Appearance and Reality*, p. 497.³ iii., 4.

scientist calls abstract Physics as opposed to applied Physics. What Bacon does blame is the substitution of final for efficient causes in Physics. This he explains quite clearly: thus in *Metaphysics* (*purgato nomine*) you may properly say "the eyelids with their hairs for a hedge and rampart are to protect the eyes"; or "the firmness of animals' skins is to keep off the heat and cold". But in Physics such final causes are useless: herein the efficient causes must be given; thus "Hairiness," you must say, "is wont to accompany the openings of damp substances (*humiditates*)"; or "the firmness of animals' skins is due to the contraction of the pores in the exterior of the body owing to cold and to the exclusion of air (*deprædationem aeris*)".¹ As he says himself: "neque hæc eo dicimus quod causæ illæ finales veræ non sint, et inquisitione admodum dignæ in speculationibus *Metaphysicæ*; sed quia, dum in *Physicarum Causarum* possessiones excurrunt, et irruunt, misere eam provinciam depopulantur et vastant". Again what he blames in Aristotle is not his use of final causes as such, but his attributing final causes or design to Nature instead of to God.

Still worse misunderstood has been the passage in which Bacon speaks of the literal unproductiveness of final causes. Bacon had divided *Philosophia Naturalis*—it will be remembered—into *Speculativa* and *Operativa*. In the following chapter² he goes on to speak of the latter and says that *Operativa* falls into two divisions: (1) *Mechanica*, corresponding to *Physica*, which produces by means of material and efficient causes; and (2) *Magia*, corresponding to *Metaphysica*, which produces by means of formal causes. Then he explains that in this subdivision of *Operativa* there is nothing corresponding to the metaphysical (*purgato nomine*) investigation of final causes: "nam causarum finalium inquisitio sterilis est, et tanquam virgo Deo consecrata nihil parit, i.e. non parit opera". Bacon, as the context shows, is here thinking of Physics and Chemistry, and in this sphere it is obvious that final causes can lead to no practical applications. The biological sciences, where alone final causes do lead to practical results, have no place in Bacon's *Philosophia Naturalis*. Later on³ he has indeed something to say about human anatomy, where he advocates both dissection of corpses and vivisection of animals; but curiously enough he nowhere seems to introduce the conception of function or adaptation, and certainly nowhere introduces the technical term *causa finalis*. Similarly, when later on he comes to speak of Ethics and Politics

¹ *E. and S.*, p. 570.² iii., 5.³ iv., 2.

and their various subdivisions he has not a word to say about Final Causes, although he approved in the *Novum Organum*, as we have seen, of their use *in hominis actionibus*.

In fact the only connexion of Bacon with the doctrine of final causes is accidental. He blames their use in Physics; he approves of their use in Metaphysics = (*purgato nomine*) our modern abstract Physics. But he never explains how they are to be sought for in his own *Metaphysica*. Thus both his rejection and admission of final causes have been, as a rule, misunderstood by writers on logical theory, who have been wont to assign him a place out of all proportion to the importance of his statements about them. Really he throws no light whatsoever either upon their use or abuse.

Spinoza's rejection of final causes is much more uncompromising: but a careful examination of his meaning will show that he rejects their use *ex analogia hominis*, as Bacon put it, not *ex analogia universi*. In fact, of their scientific use he has nothing to say: for in science he adopts the thoroughgoing mechanism of Descartes, and with the biological sciences he has nothing to do. In his time they can hardly be said to have existed. All his arguments against the scientific and philosophical abuse of final causes he has collected together in a brief appendix to the first part of his *Ethica*. There Spinoza traces the search for final causes to the anthropocentric tendency of human thought. "Men commonly suppose," he says, "that all things in Nature act, like themselves, for a purpose; insomuch that they make sure that God himself orders all things for some fixed end; for they say that God made all things for man's sake and man to worship him. The origin and ground of this belief is that men, *being ignorant* of the *real causes* of things and having a desire to seek their own interest, think themselves free to act with a view to the desired end. Of this desired end they are conscious, but they know not the causes which arouse the desire. Thus they come to regard the final cause or purpose of an action as a necessary and sufficient explanation of that action. But if in the case of another person's action they can get no positive information of its purpose, they are obliged to guess from the analogy of their own motives by which they have on other occasions been determined to actions of a similar kind. Then finding so many things in nature useful for human life—the eyes for seeing, the teeth for masticating, vegetables and animals for food, the sun for light, the sea for feeding fishes, etc.—they regard all things as instruments for man's use; and knowing that they found and did not make these conveniences, they infer

that some ruler of the world, having freedom like that of human agents, must have made them of set purpose for the benefit of mankind." Convinced that Nature does nothing in vain, *i.e.* without regard for the use of mankind, men persuaded themselves that all Nature's inconveniences—like storms, earthquakes, plagues, etc.—were sent them as punishments for wrongdoing. And, says Spinoza, "though experience did every day protest, showing by numberless examples that conveniences and inconveniences befall the pious and impious alike, they found it easier to assume that mischievous things had unknown uses than to reconstruct their habits of thought; and so made the further assumption that the counsels of God were far beyond human understanding".

Spinoza proceeds to bring forward further arguments to show that "*omnes causæ finales nihil nisi humana esse figmenta*". Among these arguments are: (1) that it is to mistake effect for cause and *vice versa*; (2) that it makes what is by nature prior, posterior; and (3) that it makes what is most perfect and supreme, most imperfect: for if God acts for an end, it must needs be that God desires something which he lacks and *ipso facto* is imperfect. Moreover upholders of final causes defend their doctrine by a new method of arguing—by reduction, not *ad impossibile*, but *ad ignorantiam*. For example, a tile falls from a roof on a man's head and kills him: the tile, they argue, must have fallen on purpose to kill him. Otherwise, if it had not been God's will, how could all the circumstances have concurred just then and there? You may answer: It happened because the wind blew and the man was passing that way. They will urge—Why did the wind blow and why did the man pass that way just at that time? If you suggest fresh reasons, they will ask similar questions, because there is no end of such questioning, until you take refuge in that *ignorantiae asyllum*, the will of God.

Finally Spinoza goes on to explain that current notions of good and evil, order and chaos, beauty and ugliness, etc., are relative to men's organs and dispositions. Thus men call whatever conduces to their own well-being *good*; whatever is the opposite of this *bad*. And because those who do not understand the nature of things, have nothing true to say about them, but only *imagine* things and mistake their *imaginations* for understanding—on that account they are firmly convinced of an *order* in things. For those things which are of such a sort that, when they are present to our senses, they can easily be imagined and consequently be

remembered easily, men are apt to call well-ordered; and things of a contrary sort, ill-ordered or confused. This good *order* they attribute to a beneficent Deity, quite forgetting the infinity of things which surpass our feeble imaginations. And thus it is that good and bad, beautiful and ugly, etc.—notions which are nothing but human ways of imagining things,—come to be considered by the ignorant as the most important properties of *things themselves*.

In the same way Spinoza would answer the common difficulties concerning his doctrine of the perfection of the universe. If, it is objected, everything is the result of God's perfection, whence come the many imperfections of Nature—corruption, ugliness, disorder, evil, sin? These, Spinoza answers, are merely human ways of imagining things. "For the perfection of things," he says, "is to be estimated from *their own* nature and power alone: and things are not more or less perfect because they delight or offend the senses of men, or because they are convenient or repugnant to human nature. If any ask, why God did not so create men that they should be governed by reason alone, I answer but this: because he lacked not matter for creating all things—from the highest down to the lowest degree of perfection: or to speak more exactly—because the laws of his own Nature were so vast as to suffice for producing all things which can be conceived by an infinite understanding."

Here Spinoza leaves his arguments—arguments all directed against *causæ finales ex analogia hominis*, interpreted in terms of human interests—against what Kant, as we shall see, calls external ends as opposed to internal ends—against ideals not yet real but to be realised. For to Spinoza God and the universe, as in God, are perfect *ἐνεργεία* and are never more or less perfect: so there can therefore be no future realisation of an end, because all is perfect as it is. For him there is no *εἶδος* existing only *δυνάμει*, whose *τέλος* it is to be realised *ἐνεργεία*: for if the universe be taken as a whole, it is already and always *ἐνεργεία ὄν*. In Spinoza's universe there is no place for change or development; all is real and actual. It is *τελειον* already, because God is *τελειος*; and thus the *εἶδος* is the *τέλος* and the *τέλος* is the *εἶδος*.

Thus final causes are to Spinoza mere illusions, *first* because they are *humana figmenta*—not the real causes or real properties of things, which are only ascertainable by the mathematical sciences; *secondly*, because in defiance of experience they interpret all things in terms of human utility and convenience, whereas there is no reason to suppose that man is the centre of the universe; and *thirdly*, because they

are inconsistent with his own conception of God and the universe, which admits neither of time nor change nor imperfection. But we may ask, are final causes any more or less *humana figmenta* than the mechanical and mathematical conceptions of science, which Spinoza assumes to be real properties of things? Again, are final causes necessarily interpreted in terms of human utility and convenience? and finally are time, change and imperfection mere illusions, merely relative to man?

Kant's treatment of final causes in the second part of the *Kritik of Judgment* will help us towards a solution of all three difficulties: he has once and for all settled the logical place of final causes in the biological sciences. He draws a clear and important distinction between internal and external ends or purposes. In the latter sense final cause is utility, *e.g.* iron is useful to men for ship-building, and with final cause in this external sense the biological sciences have nothing to do. By internal end Kant signifies the function or functions in an organism which the various organs are adapted to fulfil, *e.g.* sight is the internal end of the eye, hearing of the ear, the mature animal of the embryo. "For example," says Kant,¹ "a tree may in three ways be so regarded as an end to itself or internal end. (1) A tree generates another tree according to known laws. But the tree produced is of the same genus; and so it produces itself *generically*: for in the genus it as *effect* is continually produced by itself, and as *cause* continually maintains its generic existence by repeated self-production. (2) A tree produces itself as an individual. This kind of effect we call growth; but growth is quite different from any increase according to mechanical laws, and is just generation under another name. In adding to its bulk the tree first communicates to the new matter which it absorbs a characteristic quality, which cannot be bestowed by the mechanism of nature without it; and thus the tree develops itself by aid of a material, which as to its mode of composition is its own product. For though, as respects the constituents got from nature without, such material must be regarded as having merely a derived existence; yet in the separation and recombination of this raw material the tree displays an originality with which art cannot attempt to cope. . . . (3) The parts of the tree produce each other in such a way that the maintenance of any one part depends reciprocally on the maintenance of the rest. The bud or scion of one tree grafted on another produces in the alien stock a

¹ § 64.

plant of its own kind. Hence we may regard every twig or leaf in a tree as merely grafted on it and so as an independent tree which attaches itself to another, and parasitically nourishes itself therefrom. At the same time while the leaves are the products of the tree, they likewise in turn give support to it; for the repeated defoliation of a tree would kill it, and its growth thus depends on the reaction of the leaves upon the stem." Such internal ends,¹ or ends of nature, have the following characteristics: (1) As in a work of art, the parts are in their existence and their form conditioned by their relation to the whole. (2) The parts must be so united in the whole, that they are reciprocally causes and effects of each other's form, and that each is in relation to the others a productive organ. In other passages Kant warns us against ascribing intelligent design to nature. "Nature," he says,² "we do not regard as an intelligent being." And again—"Objective purposiveness, as a principle of the possibility of things of nature, is so far removed from *necessary* connexion with the concept of nature, that it is much oftener precisely that upon which one relies to prove the contingency of nature and its form. When, *e.g.*, we adduce the structure of a bird, the hollowness of its bones, the disposition of its wings for motion and of its tail for steering, etc., we say that all this is contingent in the highest degree according to the mere *nexus effectivus* of nature—without calling to our aid a particular kind of causality, namely, that of purpose, *nexus finalis*. In other words, nature, considered as mere mechanism, might produce its forms in a thousand different ways without stumbling upon unity in accordance with such a principle. It is not *in* the concept of nature, but quite *outside* it that we can hope to find the least ground *a priori* for this.

"Nevertheless," Kant goes on, "the teleological act of judgment is rightly brought to bear, at least problematically, upon the investigation of nature; but only in order to bring it under principles of observation and inquiry according to the *analogy* with the causality of purpose, without any pretence to *explain* it thereby. It belongs therefore to the reflective and not to the determinant judgment." In other passages Kant calls final cause a heuristic principle or again a regulative, not a constitutive judgment—phrases which in plainer English mean that the conception of final cause is a mere postulate or working hypothesis, which experience teaches us to be of great service in the investigation of all organisms,

¹ § 65.² § 61; cp. § 68.

vegetable and animal. But the distinction between reflective and determinant judgment, or its synonyms regulative and constitutive judgment, goes back to the Kantian epistemology—to his own arbitrary distinction between Understanding and Reason, according to which efficient causality is a conception of the Understanding, but final causality an idea of the Reason. According to this doctrine, the ultimate laws of Nature, like causality, substance and reciprocity, are *a priori*, universal and necessary, and as such are conceptions of the Understanding, which, though they become consciously known in the course of our experience, are in no sense derived from experience, but are *a priori* principles of synthesis which the Understanding imposes upon Nature and by aid of which the Understanding produces order and system out of the chaos of sense-perceptions. Yet at the same time that Kant claims this *a priori* origin for the most general laws of Nature, he admits the empirical origin of all the more special laws of Nature, like, *e.g.*, the law of gravitation and the laws of motion, though he is unable to give us any differentia, whereby to distinguish the one class of laws from the other. In fact we have here come upon the weak point in Kant's whole theory of natural science. By a sort of circular argument he assumes that these most general laws of Nature are *a priori*, because they are universal and necessary; and that they are universal and necessary, because they are *a priori*. He does not appreciate the significance of Hume's distinction between relations of ideas to one another and matters of fact, and so fails to see that the necessity of all natural laws, so far as they have any necessity at all, is only logical, not real, necessity. In other words he does not realise the full significance of the ideality of the subject-matter of all the natural sciences, that no science deals with the concrete individual of perceptual experience as such, but only with certain aspects common to many individuals, which are abstracted ideally from their particular surroundings; and that it is in this sense that science, as Aristotle said, is always of the *καθόλου*, never of the *καθ'ἑκαστα*.

We shall understand this better if we take Kant's category of causality as our example, the category which he regards as the most fundamental of all the laws of Nature. Hume, testing the conception by reference to our sense perceptions, had reduced causality to invariable succession; and the necessary connexion regarded by philosophers as underlying our conception, he maintained, was only a mental fiction due to the arbitrary association of our ideas of actual causes and effects. Kant replied that causality is not a mental

fiction, but a mental principle of synthesis, and that without causality as a *prius* we could never attain to the idea of succession at all. But if Nature be taken in its mechanical aspect only, as consisting of the primary qualities of matter, Hume's analysis is perfectly right. In this mechanical world causality, so far as natural science can know it, is mere succession; and the causality which Kant would attribute to Nature is the efficient causality which we are conscious of in the actions of our own wills. Whether ultimately we are justified in attributing *ex analogia hominis* the same or similar causality to Nature is a further question and a metaphysical question. But with such causality mechanical science as such has nothing to do: it can get on better without assuming it and *entia non sunt multiplicanda præter necessitatem*. In fact, if by Nature we mean the Nature of mechanical science (and this is what Kant in this context does mean by Nature), causality in its full sense is not a constitutive principle or determinant judgment at all. So long as we stick to quantities causality is merely the invariable sequence of consequent upon antecedent, nothing more nor less: for such sequence alone admits of mathematical determination in terms of number and quantity. Really,¹ the objects of all mechanical sciences are not the things of common experience as such at all, but only one particular aspect of them, namely, their primary qualities; and this aspect, like all other particular aspects, is arrived at by mental abstraction and construction. Equally true is it that the mechanical explanation or description of these primary qualities, when it is given, is just as much a mental product. Though it deals with matter and motion, it is expressed in terms of law, number, or measure—all three of them mental products. But so soon as we pass from quantitative to qualitative relations and changes, causality merely as succession is not sufficient. As a working hypothesis we find ourselves forced to use the notion of efficient causality, of the power to produce, as when we observe the heat of the sun melting wax. Mechanical science of course attempts to reduce qualitative to quantitative relations; but when it is unable to do so—and in many cases it is unable—then it can hardly move a step without the working hypothesis or conception of efficient causality. In Kantian language we use efficient causality as a heuristic principle, going beyond our sense-perceptions in order to reduce their manifold to unity. Only, as we have seen

¹ Cp. Sturt's *Personal Idealism*, p. 207.

already, Kant is not content with calling the law of causality a mere heuristic principle. He calls it a category of the Understanding, which the Understanding uses in its creation of Nature, and which, as an *a priori* principle of synthesis, is just as universal and necessary as are the laws of logic and mathematics. But for science, whatever it may be for metaphysics, we maintain that this is just what it is not. As Paulsen puts it,¹ "in physics we have to reckon with an irrational factor, which renders it impossible to decide upon the truth of propositions by means of mere immanent reflexion; we must consult sense-observation. And this irrational factor does not disappear even in the ultimate principles. It is attached to the laws of biology and chemistry, and likewise to the laws of mechanics. . . . What they need is a working maxim for their investigation, and they have that in the law of causality or the principle of the uniformity of nature, even if it is not a law of the pure understanding, but merely a principle constructed by the understanding on the basis of the datum and found to be useful."

So when we pass from physics and chemistry to biology—to the science of organisms, our logical procedure is exactly the same. Organisms as concrete particular individuals are not possible objects of science at all, until we can discover what common qualities they possess. These common qualities we can in thought abstract from the particular individuals possessing them, and according to their different natures they fall within the scope of different sciences, each of which in its investigations uses its own appropriate principles (*ιδίαι ἀρχαί*) or working hypotheses. So far as organisms exhibit mechanical properties, these properties, these quantitative relations, are dealt with by the mechanical sciences of number and measure, where causality as mere succession reigns supreme. Again, so far as organisms possess chemical qualities, they are dealt with by chemistry; and when these chemical qualities defy analysis in terms of quantity, then the chemist finds himself obliged to introduce efficient or productive causality as his working hypothesis, simply because his own and others' experience proves it to be useful. Finally organisms, over and above these primary and secondary qualities, exhibit the adaptation of organs to functions; and here the only fruitful principle that the biologist can use is the conception of final cause—of the adaptation of means to ends, which like the principle of efficient causality and in-

¹ *Kant*, E. T., p. 205.

deed all other scientific principles, has its basis in our own experience, in this case, the experience of our own conscious adaptation of means to ends in our voluntary actions. But he need not, in fact he does not, use the conception in its entirety—at least for the purposes of his science. For though he cannot get on without the conception of adaptation of means to ends, he need not, as a biologist, assume in the organisms with which he is dealing, self-conscious personal subjects, who purposely design means to carry out preconceived ends. Such an assumption is quite unnecessary, because it is not required for his interpretation of the observed facts of his science. It is not an element in the abstract conception of organism, which *ex hypothesi* stands as the fundamental conception of his science. On the other hand the sociologist in investigating the facts of human society makes the conception of purposively acting self-conscious agents the starting-point or working hypothesis of all his subsequent researches. Such then is the logical place of final cause in biological science: it is the appropriate conception which the nature of the subject-matter forces the mind to use in its investigation of the adaptation of means to ends in organisms, and its justification is simply its success. No biologist can get on without it; the written works of all biologists from Aristotle to Sir Michael Foster are full of it.

But before we leave the place of final causes in biology, there is one other point to be noticed, which goes far to explain the prejudice still found in modern scientists against them.¹ This point is that the conception of final cause has often led to the discovery of the efficient and mechanical causes, as, *e.g.*, in the case of Harvey's discovery of the circulation of the blood; and that as the latter alone are practically useful, final cause may be neglected as the mere scaffolding to the main building. Thus Robert Boyle² tells us: "I remember that when I asked our famous Harvey, what were the things which induced him to think of a circulation of the blood, he answered me that, when he took notice that the valves in the veins of so many parts of the body were so placed, that they gave a free passage to the blood towards the heart, but opposed the passage of the venal blood the contrary way—he was incited to imagine that so provident a cause as Nature had not placed so many valves *without design*, and no design seemed more probable than that the blood should be sent through the arteries and

¹ Cp. Sigwart, *Logic*, Eng. Trans., ii., 172.

² *Inquiry into the Final Causes of Natural Things*, §§ 1-2.

return through the veins, whose valves did not oppose its course that way". Harvey's observation of the function or final causes of these valves led him to the investigation of the mechanical problem, how, when so much blood was forced out of the heart at each beat of it, the supply of blood was yet maintained, and to this problem he discovered the mechanical solution in the circulation of the blood. Now the description of mechanical causes always admits of much greater precision—often mathematical precision—than the description of final causes, and moreover mechanical causes come first in the order of production and are therefore of more practical use. But, as Sigwart points out,¹ so far from there being any inconsistency between the two points of view, "the final concept does not contradict the causal treatment, but insists upon it". The end *P* is the joint product of certain efficient causes *abc*, working in relation to each other, and the mind of the investigator can travel according to convenience either backwards from *P* to *abc*, or forwards from *abc* to *P*. Here² "the importance of the final concept rests only upon the fact that it expresses the unity of a system of parts which are such that when taken in isolation we are unable to deduce this particular combination (*P*) from their nature". This procedure is precisely like the procedure in geometry when we assume the problem already solved with the view of discovering geometrical means to its solution.

Enough however has now been said to prove the utility of the concept of "internal" final cause in biological science; for if it can be shown to be useful, no other justification is needed for its scientific adoption—any more than for any other scientific working hypothesis. But the evolutionary biologist cannot stop here: for he is concerned³ not only with (1) "the universal essence upon which the organic is grounded" and (2) "its laws of development," but also with (3) "the external causes which determine it in this or that direction". Here he cannot indeed avoid the application of the conception of "external" final cause as a working hypothesis for his study of the *environment* of organisms, but he finds its application far less successful and universal. As Kant puts it,⁴ "the internal form of a mere blade of grass is sufficient to show that for our human faculty of judgment its origin is possible only according to the rule of purposes. But if we change our point of view and look to the use which other natural beings make of it,

¹ Sigwart, ii., p. 176.

³ Cp. Sigwart, ii., p. 332.

² *Ibid.*

⁴ § 67.

abandon the consideration of its internal organisation and only look to its externally purposive references, we shall arrive at no categorical purpose. . . . Hence it is only so far as matter is organised that it necessarily carries with it the concept of a natural purpose, because this, its specific form, is at the same time a product of nature. But this concept *leads necessarily* to the idea of collective nature as a system in accordance with the rule of purposes." In other words the biologist is led to make the assumption that "everything in the world is in some way good for something: nothing is vain in it". "By the example that nature gives us in its organic products we are justified,"¹ says Kant, "nay, called upon, to expect of it and of its laws nothing that is not purposive on the whole." Then the assumption of external purposiveness once made, the only way to justify it is to discover how far it works. "There is," says Kant,² "only one external purposiveness which is connected with the internal purposiveness of organisation, and yet serves in the external relation of a means to a purpose, without the question necessarily arising—to what end this being so organised must have existed. This is the organisation of both sexes in their mutual relation for the propagation of their kind; since here we can always ask, Why must such a pair exist? The answer is: This pair first constitutes an *organising* whole, though not an organised whole in a single body."

Similarly the conception of external purposiveness is useful as a principle of synthesis in tracing the development of plants and animals in relation to their environment. The biologist uses the conception in studying the adaptation of the eye to the properties of light, of the teeth of various animals to their varying kinds of food, of the organs of locomotion to the varying modes of traversing space and its obstacles. He uses it again in the study of animal instincts, *e.g.*, the building instincts of wasps, bees, birds, beavers; or again the instincts of concealment amid their surroundings found in so many insects, animals, and plants. But in all such cases he takes for the end subserved the preservation of the life and health of the animal or plant in question.

But when we extend the conception of external cause to nature as a whole, we find as many destructive as preservative agencies. The waste of nature staggers the most downright optimist. War, pestilence and famine are as rife among animals and plants as among men; and even if we grant—what is a very large assumption—that in the

¹ § 67.² § 82.

struggle for existence not only the *fittest* but the *best* always survive and that the progress is ever upwards, still this progress is bought at a most frightful cost of pain, suffering and death, not merely of individuals, but of whole races of plants and animals. Such problems however are moral and metaphysical and have nothing to do with the logic of final causes in the biological sciences. In these sciences the conception of final cause, in the external applications just briefly indicated, is as much a methodological postulate as in its internal applications: and its justification depends here also solely upon its utility. Here also its use is analogical—drawn from our conscious subordination of means to ends in our voluntary actions; and in using it the biologist reasons as if Nature were an intelligent agent consciously selecting adequate means to preconceived ends. At the same time he is or should be well aware of the limitations to its legitimate use. He uses it to reduce to unity the manifold facts, observed through sense perception, of plant and animal life, and for the purposes of his science he need not postulate that Nature is an intelligent cause in the same sense as he knows himself to be intelligent, nor yet that Nature preconceives her ends in idea, which she purposes to make real in fact, in the same way that he himself proceeds in his own voluntary actions. His science does not need such assumptions, and if made, they produce confusion and illusion; and for this reason biology will have none of them, and rightly so.

But even the biologist is a man, and every man, we know, is a metaphysician. So what are mere postulates to the biologist become the gravest problems to the metaphysician. The latter asks, how are they possible? what do they imply? and Kant himself in an appendix to the *Kritik of the Judgment* goes far to propound a solution, though he never worked out his ideas.

Kant's starting point is the necessity of the conception of final cause in the sciences of organic life.¹ “(1) *For the reflective judgment*,” he says, “it is therefore quite a correct fundamental proposition, that for that connexion of things according to final causes which is so plain, there *must be thought* a causality distinct from that of mechanism, *viz.*, that of an (intelligent) cause of the world acting in accordance with purposes, but (2) for the *determinant judgment* this would be a hasty and unprovable proposition. In the first case it is a mere maxim of the judgment, wherein

¹ § 71.

the concept of that causality is a mere 'idea,' to which we by no means undertake to concede reality; but which we use as a guide to reflexion, which remains thereby always open to all *mechanical* grounds of explanation and does not withdraw out of the world of 'sense'. In the second case the proposition would be an objective principle prescribed by *reason*, to which the determinant judgment must subject itself, whereby however it withdraws beyond the world of *sense* into the transcendent and perhaps is led into error."

As to the existence of final causes in nature, Kant points out, four views have been prevalent in philosophy: two he calls Idealist, and two Realist; the two former denying and the two latter admitting their real existence.

(1) The Idealists explain final causes away as an illusion: either (α), like Democritus and Epicurus, reducing everything to mechanical causation without attempting to account for the delusion; or (β), like Spinoza, reducing final purposiveness to fatality, and explaining the illusion of mutual adaptation in things as due to the unity of the substratum of all natural things.

(2) The Realists are either (α) Hylozoists who explain the purposes in Nature—upon the analogy of a faculty acting with design—by the life of matter, a world-soul, *anima mundi*; or (β) Theists, who explain them as derived from an intelligent Being, a God, who produces them with design. Kant, as we shall see, holds to the last view as a matter of faith, but denies that it is a provable proposition.¹ It is not provable because "the concept of a causality of nature according to the rule of purposes, still more of a Being such as cannot be given us in experience (*i.e.*, through sense-perception)—a Being who according to the rule of purposes is cause of Nature—though it is thinkable without contradiction, is not to be dogmatically asserted: for it is neither derived from experience nor necessary (*i.e.*, like causality) to the possibility of experience". It is not however a matter of blind faith, but of a faith based on a critical analysis of scientific method: "We cannot," says Kant,² "otherwise think and make comprehensible the purposiveness which must lie at the bottom of our knowledge of the inner possibility of many natural things than by representing it and the world in general as a product of an intelligent cause (a God)."

So far and no farther Kant's critical analysis carries him; but after all he does not rest content with his own conclusion. Reason, as distinct from understanding, demands more than

¹ § 74.

² § 75.

a mere reflective principle of judgment; and Kant attempts to satisfy these demands by admitting the possibility—in the sense of implying no inherent contradiction—both of an intelligent cause of Nature and of a supreme end of Nature. The former is God, the second is man. How then does Kant arrive at making man the supreme end of Nature?

As a natural organism Kant is never weary of pointing out that man is no more the end of nature than any other organism. "Nature," he says,¹ "has not taken him for her special darling and favoured him with blessings above all animals. Rather, in her destructive operations—plague, hunger, perils of waters, frost, assaults of other animals great and small, etc.—in these things she has spared him as little as any other animal. . . . Man is then always only a link in the chain of natural purposes—is a means for the maintenance of purposiveness in the mechanism of the remaining links."

How then, once more we ask him, is he Nature's supreme end? "As the only being on earth," Kant answers, "which has an understanding and consequently a faculty of setting arbitrary purposes before itself,² he is certainly entitled to be the lord of Nature; and if Nature be regarded as a teleological system, he is by his destination the ultimate purpose of Nature. But this is *subject to the condition* of his having an understanding and the will to give to it and to himself such a reference to purposes as can be self-sufficient *independently* of Nature, and consequently can be a final purpose; which final purpose however must not be sought in Nature itself."

Obviously man's happiness is not the supreme end of Nature: for "the value of life³ for us, if we estimate it by that which *we enjoy* (by the natural end of all our desires which is happiness), is easy to reckon. It is less than nothing." But there is another supreme end possible—man's culture and moral discipline; and from this point of view we can regard Nature as a means to man as its end, and we can see "what Nature can do for man to prepare him for that which he must do for himself in order to be the final end".⁴

From the point of view of *culture* Nature tends to develop man's power of setting ends to himself and his capacity to make out of his life an ordered whole, by putting him in war and competition with his fellow-men—strenuous conditions which impel him to self-reliance and inventive-

¹ § 83.² § 83.³ § 83, note.⁴ § 83.

ness.¹ Thus, says Kant,² "this splendid misery is bound up with the development of the natural capacities of the human race, and the purpose of Nature itself, although not our purpose (*i.e.*, happiness), is attained." From the point of view of discipline Nature only indirectly helps to make man "receptive of higher purposes than she can herself supply, and to free his will from the despotism of desires through the experience which he gains of the benefits of self-mastery and the evils entailed by the loose indulgence of his natural inclinations".³ It is then not as a natural, but only "as a moral, being that man can be the final purpose of creation".⁴ Why? Because, says Kant, in him alone we find "teleological causality," *viz.*, he alone sets up ends before himself; and because "man alone represents the law according to which he has to determine purposes for himself (the moral law), as unconditioned and independent of all natural conditions".⁵ "If now things of the world, as beings dependent in their existence, need a supreme cause acting according to purposes, man is the supreme end of creation; since without him there would be no ultimate point in Nature to which the chain of subordinate ends could be attached. Only in man and only in him as subject of morality do we meet with unconditioned legislation in respect of purposes, which therefore alone renders him capable of being a final end or purpose, to which the whole of Nature is teleologically subordinated."⁶

Here Kant leaves the question of man as the supreme end of Nature to pass to the question of the intelligent *cause* of Nature.

Physical teleology, according to Kant, can never become a physico-theology, though it is of great value as a propædeutic to theology. At most it can only⁷ "justify the concept of an intelligent world-cause, as a *subjective* concept (only available for the constitution of our theoretical faculty) of the possibility of things that we can make intelligible to ourselves according to purposes; but it cannot determine this concept further; and it cannot determine this concept further, because the purposive reference in physical teleology is and must be always considered only as conditioned *in* Nature, and it consequently cannot inquire into the purpose for which Nature itself exists (for which the ground must be sought *outside* Nature). Physical teleology does indeed interpret natural purposes according

¹ Caird, *Kant*, ii., p. 501.

⁴ § 84, note.

⁵ *Ibid.*

² § 83.

⁶ *Ibid.*

³ § 83.

⁷ § 85.

to the analogy of our own voluntary activities ; but as such, it cannot tell us whether the agent is really *intelligent*, or *perfect*, or even whether it is *one*." On the contrary, with all our knowledge of Nature it remains quite undecided whether the supreme cause is an all-wise and all-moral God or only an "understanding determined by the mere necessity of its nature to the production of certain forms (according to the analogy of what we call the *art-instinct* in animals)".¹

The question therefore can only be solved by moral theology. Only as a moral being, Kant has already shown us, can man be the final end of nature.² "A good will is that whereby alone his being can have an absolute worth, and in reference to which the being of the world can have a final purpose." But "such realisation of the supreme end through morality"—to quote Dr. Caird's³ summary of Kant's argument—"is no *natural* sequence of effect or cause; for there is nothing in the connexion of physical causes that has any relation to such an end. We are forced therefore by the same *moral* necessity which makes us set before us such an end, to postulate *outside* of Nature a Cause that determines nature so as finally to secure this result; and from this follows necessarily the idea of an all-wise, all-powerful, all-righteous, all-merciful God." We have a "pure moral need for the existence of such a Being; and our moral needs differ from physical needs in that they have an *absolute* claim to satisfaction".

The existence of such a Deity is therefore, not a theoretical, but a *practical* postulate.⁴ This postulate compels us to think of God "as a rational Being, who is guided by the idea of an end and who uses Nature as means to it"; but this conception rests on an imperfect analogy: such separation of means and ends holds only from a human point of view. For "though⁵ in us morally practical reason is essentially different in its principles from technically practical reason, we cannot assume that it must be so likewise in the supreme World-Cause, or that the divine intelligence, in subordinating nature to the final end, needs to exert a special kind of causality, different from that which it exerts in producing those natural things which are ends to themselves. While therefore we have in our own final purpose a *moral ground* for assuming a final purpose of creation as an effect, we have not in the same sense a *moral ground* for assuming a Moral Being as the source of creation. All that we can say is that, con-

¹ § 85, end.² § 86.³ Caird, *Kant*, ii., 504.⁴ Cp. Caird, *ibid.*, p. 505.⁵ § 88, p. 387.

sistently with the nature of our intelligence, we cannot make intelligible to ourselves the possibility of such an adaptation of Nature to the moral law and its object as is involved in the final end which the moral law commands us to aim at—except by assuming the existence of a Creator and Governor of the world, who is a moral legislator.

Thus for Kant there is no theoretical or scientific proof of the existence of a moral Deity—not even a working hypothesis: for a scientific hypothesis must at least be certain of the possibility of a given phenomenon, *i.e.* as a possible object of sense perception. The being of God is a matter of *faith*, but of faith as grounded in our reason as necessary for its self-determined ends. And for Kant moral necessity has always an *absolute* claim to which theoretical reason can make no pretence.

No philosopher has really done more than Kant to prove the truth of the maxim that the sciences are special but philosophy is general; and yet at the same time he was so steeped in the psychology of separate faculties, that his philosophy to the end remained a sort of system of water-tight compartments with no channel of communication from one to the other. He so rigidly distinguishes between sense, understanding and reason, between the subject and the object, the *a priori* and the *a posteriori*, the theoretical, practical, and æsthetic, the necessary and universal as against the contingent and particular, that he never succeeds in bringing them together again, although the whole tendency of his teaching is to show that such distinctions are not ultimate, and that the real business of philosophy is to discover a principle of unity whereby to overcome them.

Science, it has been well said, must treat the world of objects as self-subsistent in abstraction from the knowing subject. Philosophy must start from the ultimate fact of the duality of subject and object in the unity of experience and reinterpret the lessons of the sciences, of psychology, of ethics, of religion in their relations to the thinking and willing subject. It cannot limit, as Kant always tends to do, experience to the sphere of sense-perceptions; but it must recognise that in all departments of human activity and knowledge, in mathematics, in the natural sciences, in psychology, ethics, sociology, and religion, practical interest is an essential element, and that in all experience alike the two factors are present, *viz.*, subject and object: and that everywhere alike consistency of all the elements with the whole and with each other—the elements both of knowledge and of practice

—is the only and the ultimate test of truth. The fundamental assumption of all investigation is that the object, in whatever sphere it may be, is intelligible, and from this it follows that so far as it is intelligible, just so far is it an object made by mental construction. Even mathematics is no exception.¹ “Exact reasoning” (in Mathematics), says Mr. Peirce, “is a process of experiment performed upon an artificial object, an object made indeed by the mathematician, but observed by him just as truly as a star or as a physiological process is observed by the student of another science, experimented upon just as truly as one experiments in a laboratory.”² Mr. Schiller, too, in company with other well-known logicians, has recently tried to show us that axioms and other so-called necessary truths are in their origin postulates and working hypotheses which experience has shown us to work well, and that their origin is to be found in our own practical needs in dealing with the world of objects around us. Man is the child of Nature: and he can only know Nature in so far as he can see himself in her, and only master Nature in so far as he can make her subserve and conform to his practical needs. His most fundamental ideas, space, time, number, identity, similarity, causality, etc., all have their origin in the contact of his mind with other minds and natural objects, and he extends their dominion and believes in their validity just so far as they are verified in his experience. Some of them are exact, like number and measure, and as such they specially commend themselves to the man of science: others do not admit of this exact expression and so are regarded as of less value in science, and *final cause* is a conception of the latter class. Its origin in reflexion upon the conscious process of man’s voluntary actions is obvious. By analogy man extended it to the acts of animals and plants, even to inorganic things, and to the universe as a whole: in some cases he found the conception work well as an hypothesis, in others ill; but as in the case of other conceptions, so here experience is the only test of its validity and of the extent of its validity. Hence we are now in a better position than were Bacon, Spinoza, and Kant to estimate its value; for we have seen it applied with the most successful results in the biological sciences, which were practically non-existent in the lifetime of those philosophers. It is true that the biologist in investigating the adaptation of organism to environment and of environment to organism

¹ Quoted by Prof. Royce, *The World and the Individual*, i., 254.

² Cp. Sturt’s *Personal Idealism*, p. 50 ff.

by the process of natural selection does not stop or need to ask, whether such adaptation is the result of conscious design, and that he speaks of the variations as due to "chance," *i.e.*, to causes of which he knows nothing or little. But to the philosopher this modest limitation of the biological postulate makes but little difference. As to the origin of the conception in the conscious human will he has no doubt whatever, so that the success of the scientist's application of final cause is for him a most important piece of evidence for the unity of the active principle at work in Nature and in man. In Kantian language it shows him that final cause is no mere reflective judgment, no mere illusory hypothesis, but a constituent element in Nature, just as much as the principle of causality. And so it is with all the principles which the human intelligence uses successfully to make the world of nature intelligible to itself. As Dr. Caird puts it,¹ "Thus we are led to think of one principle underlying all differences, and which, through the difference and apparent external determination of different material elements by each other, is working towards the realisation of itself". Man's science, man's philosophy, man's religion—all are anthropomorphic, and rightly so. For the not-self can only exist in relation to the self, so that the extension of knowledge and power over the one element carries with it or rather is identical with the extension of knowledge and power over the other. *Anthropomorphic* philosophy and science must always be: but they must rest not on the transient sense-perceptions of the individual man, but on the rationally constructed experience of the human race.

¹ *Kant*, ii., 541.