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Paul Forster

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## CHAPTER I

*Nominalism as demonic doctrine*

The question of whether laws and universals are real is central to Peirce's philosophy. He thinks the division of philosophers into realists – who think there are real laws and universals – and nominalists – who think laws and universals are merely products of the mind – cuts across more familiar contrasts between rationalists and empiricists, naturalists and transcendentalists, and so affords a novel perspective on the philosophical tradition. More provocatively, Peirce views realists as allied with a medievalist – Duns Scotus<sup>1</sup> – against 'all modern philosophers' (SS: 115, 1909).<sup>2</sup> Yet this alliance is dedicated to the advancement of scientific philosophy, not its overthrow. So positioned, Peirce's realism is a revolutionary doctrine as well.

<sup>1</sup> Peirce views the triumph of Ockhamism over Scotism as a political victory rather than an intellectual one: 2.166–8, 1902; 4.34–5, 1893; 6.348, c. 1909; 6.361, 1903; and 7.666, 1903. 'If [Scotus'] logic and metaphysics, not slavishly worshipped, but torn away from its medievalism, be adapted to modern culture, under continual wholesome reminders of nominalistic criticisms, I am convinced that it will go far toward supplying the philosophy which is best to harmonize with physical science' (1.6, c. 1898).

<sup>2</sup> Peirce describes the modern era as 'a tidal wave of nominalism' and observes that 'Descartes was a nominalist. Locke and all his following, Berkeley, Hartley, Hume and even Reid, were nominalists. Leibniz was an extreme nominalist ... Kant was a nominalist ... Hegel was a nominalist of realist yearnings. I might continue the list much further' (1.19, 1903). Indeed his list includes: Peter Abélard (W2: 481, 1871), Cornelius Agrippa (1.18, 1903), Aristotle (NEM 4: 295, c. 1903), Alexander Bain (4.33, 1893), Jeremy Bentham (4.33, 1893), Claude Bernard (1.109, c. 1896), Boëthius (6.93, 1903), Thomas Brown (8.37, 1871), Paul Carus (6.593, 1893), Chrysippus (NEM 3: 235, 1911), the Conceptualists (1.27, 1909), Charles Darwin (8.38, 1871), Durandus (W2: 475, 1871), the Epicureans (1.18, 1903), Johann Fichte (4.551, 1906), Ernst Haeckel (5.468, 1905), William Hamilton (6.492, c. 1896), David Hartley (8.37, 1871), Edward Hegeler (4.1, 1898), Hermann von Helmholtz (8.38, 1871), Thomas Hobbes (4.33, 1893; 5.392n1, 1903), John of Salisbury (W2: 481, 1871), Justus von Leibig (8.38, 1871), Raymond Lully (5.392n1, 1903), Ernst Mach (4.1, 1898), James Mill (4.33, 1893), John Stuart Mill (4.33, 1893), Karl Pearson (5.468, c. 1905), the early Charles Peirce (6.270, 1892; 8.208, c. 1905; 8.214n1, 1910; and 8.216, 1910), Platonists (5.470, c. 1906), Joseph Priestley (8.37, 1871), Rémusat (1.19, 1903), Charles Renouvier (6.505, c. 1906), Roscellinus (5.470, 1906), the medieval Sceptics (1.18, 1903), Duns Scotus (1.560, c. 1905 and 8.208, c. 1905), the Stoics (1.18, 1903; 3.613, 1911; and NEM 3: 201, 1911), William of Ockham (W2: 311, 1869), F.C. Wolf (6.590, 1893), Chauncey Wright (5.64, 1903), Wilhelm Wundt (5.468, 1905) and 'the thinkers of the years about 1700' (5.470, c. 1906).

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Still, it is not obvious why Peirce should view the question of the ontological status of laws and universals as fundamental to philosophy. Nor is it obvious what there is in so abstract a question to elicit the contempt he directs towards his nominalist adversaries. Peirce insists that a pragmatist 'will be the most open-minded of all men' (5.499, *c.* 1905), yet this does not stop him from denouncing nominalism as 'the most blinding of all systems' (5.499, *c.* 1905), a 'disgraceful habitude' (6.175, 1906) and a 'philistine line of thought' (1.383, *c.* 1890). He declares nominalism 'a protest against the only kind of thinking that has ever advanced human culture' (3.509, 1897) and 'deadly poison to any living reasoning' (NEM 3: 201, 1911). He takes it to involve 'monstrous' doctrines (1.422, *c.* 1896) defended by 'mostly superficial men' (W2: 239, 1868) who 'do not reason logically about anything' (1.165, *c.* 1897). Nominalism, he says, is 'of all the philosophies the most inadequate, and perhaps the most superficial, one is tempted to say the silliest possible' (NEM 4: 295, 1905). It 'and all its ways are devices of the Devil, if devil there be' (SS: 118, 1909).<sup>3</sup>

Much of Peirce's antipathy towards nominalism derives from his views about science. If, as he maintains, 'science has always been at heart realistic, and must always be so' (1.20, 1903), then nominalism is 'anti-scientific in essence' (2.166, 1902) and an obstacle to intellectual progress. Yet Peirce's admiration of science does not account fully for his antagonism towards nominalism. He says that 'though the question of realism and nominalism has its roots in the technicalities of logic, its branches reach about our life' (W2: 487, 1871). 'Not only does all *science* hang upon the decision but so do Truth and Righteousness!' (SS: 117–18, 1909). Nominalism, for him, is 'the dreary outlook upon a world in which all that can be loved, or admired, or understood, is figment' (SS: 118, 1909). It is a 'disease' (SS: 118, 1909), and the 'remedy for it consists in allowing ideas of human life to play a greater part in one's philosophy' (5.121, 1903). Clearly, Peirce sees more at stake in the nominalism question than the proper understanding of the ontology of science. For him, nominalism

<sup>3</sup> Peirce grants that nominalism offers a simpler account of the world than realism does and thus is a view that ought to be tried first (4.1, 1898). He even concedes that efforts to defend nominalism, though failed, have 'been most precious for the clear comprehension of logic and of metaphysics' (4.1, 1898). Nevertheless, he says, 'the average nominalist ... reminds me of the blind spot on the retina, so wonderfully does he unconsciously smooth over his field of vision and omit facts that stare him in the face' (4.1, 1898).

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implies a worldview, one with disastrous consequences – and not just for intellectuals. As he says:

It is not modern philosophers only who are nominalists. The nominalistic *Weltanschauung* has become incorporated into what I will venture to call the very flesh and blood of the average modern mind. (5.61, 1903)

Given Peirce's assessment of what is at stake in the nominalism debate and his conviction that the question is 'as pressing today as it ever was' (4.1, 1898), it is clear why he views the defeat of nominalism as 'the most important consequence' of pragmatism (8.258, 1904).

For all the significance he accords the matter, Peirce says surprisingly little about the connection between nominalism as a theory of laws and general concepts and nominalism as a 'dreary outlook' or '*Weltanschauung*'. Nevertheless, what he does say gives a fairly clear indication of the worldview he wishes to combat:

The realistic philosophy of the last century has now lost all its popularity, except with the most conservative minds. And science as well as philosophy is nominalistic. The doctrine of the correlation of forces, the discoveries of Helmholtz, and the hypotheses of Liebig and of Darwin, have all that character of explaining familiar phenomena apparently of a peculiar kind by extending the operation of simple mechanical principles, which belongs to nominalism. Or if the nominalistic character of these doctrines themselves cannot be detected, it will at least be admitted that they are observed to carry along with them those daughters of nominalism, – sensationalism, phenomenalism, individualism and materialism. (W2: 485–6, 1871)

He also hints at the moral and political implications of nominalism that he finds troubling when he writes:

The question of whether the *genus homo* has any existence except as individuals is the question of whether there is anything of any more dignity, worth, and importance than individual happiness, individual aspirations, and individual life. Whether men really have anything in common, so that the *community* is to be considered as an end in itself, and if so, what the relative value of the two factors is, is the most fundamental practical question in regard to every public institution the constitution of which we have it in our power to influence. (W2: 487, 1871)<sup>4</sup>

<sup>4</sup> Describing the reception of Darwin, Peirce writes: 'Mechanism was now known to be all, or very nearly so. All this time, utilitarianism – that improved substitute for the Gospel – was in its fullest feather; and was a natural ally of an individualistic theory ... [Darwin's] hypothesis, while without dispute one of the most ingenious and pretty ever devised ... did not appear, at first, at all near to being proved ... but the extraordinarily favourable reception it met with was plainly owing, in large measure, to its ideas being those toward which the age was favorably disposed, especially, because of the encouragement it gave to the greed-philosophy' (6.297, 1893).

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To explain what Peirce takes the nominalist worldview to be, it is not necessary to provide a comprehensive discussion of the doctrines alluded to in these passages. As he observes, nominalism is ‘a broad question and it is proper to look beyond the letter into the spirit of it’ (4.1, 1898). What follows, therefore, is an outline in the most general terms of the target on which Peirce trains his sights and of his motives for doing so. Its purpose is merely to provide sufficient background for the detailed exploration of Peirce’s thought to follow.

THE ESSENCE OF NOMINALISM<sup>5</sup>

Nominalists hold that reality comprises individuals.<sup>6</sup> They deny there are laws operative in the world and that there are kinds of things in nature apart from thought. On their view, a complete theory of the world could be given by enumerating individuals and their particular traits without the use of laws or general concepts, even if, as they allow, exhaustive knowledge of the world in its particularity is beyond the capacity of finite minds.

According to nominalists, the individuals that make up reality manifest themselves to knowers through experience – in perception and introspection. On their view, immediate experience is a chaotic torrent of independent data that is organized by the mind to form a coherent view of reality. Individuals given in experience are subsumed under general concepts on the basis of their similarities, and when individuals of one kind are found alongside individuals of another kind repeatedly, the association is formulated as a law. However, nominalists insist that the laws and general concepts used to order experience are neither given in experience nor objectively derivable from it. They point out that since any two things are both similar and different in limitless ways, talk of similarity is intelligible

<sup>5</sup> This section is based on Becker (1968), Boler (1963), Bowler (1984), Greene (1981), MacIntyre (1984), Unger (1975), Weiner (1949) and Young (1973, 1985) as well as Abbot (1885), Bain (1977), Boole (1958), Buckle (1871), De Morgan (1966), Fiske (1874), Kant (1988, 2007), Laplace (1951), Leibniz (1969), Locke (1975), Mill (1973), Ockham (1964), Quetelet (1848, 1969, 1981) and Spencer (1945). Relevant discussions by Peirce include: W1: 79–83, 1861; W1: 88–9, 1861; W1: 101–14, 1863; W2: 122–30, 1867–8; W2: 144–54, 1868; W2: 211–42, 1868; W2: 302–7, 1869; W2: 310–45, 1869; W2: 462–90, 1871; W3: 14–108, 1873; W3: 235–7, 1877; W3: 306–22, 1878; W4: 152–6, 1880; W4: 378–82, 1882; W5: 260–1, 1885; W5: 285–9, 1886; 3.613, 1911; 6.297, 1893; 6.492, c. 1896; 8.132–56, 1900; and 8.157–63, 1901. Peirce would not, and need not, hold that everyone he calls a nominalist accepts all of the doctrines discussed in this section. He attaches the label to anyone at odds with what he deems to be the correct form of realism on the grounds that they aid the nominalist cause.

<sup>6</sup> Peirce says, ‘[t]he heart of the dispute lies in this. The modern philosophers – one and all unless Schelling be an exception – recognize but one mode of being, the being of an individual thing or fact’ (1.21, 1903). Nominalism, for him, is ‘[t]he doctrine that nothing is general but names; more specifically, that common nouns, as *man*, *horse*, represent in their generality nothing in the real things, but are mere conveniences for speaking of many things at once, or at most necessities of human thought; individualism’ (EP 1: xxiv, nd).

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only for a given point of comparison. Since, they claim, individual experiences do not single out which among the myriad similarity relations must be chosen as relevant for purposes of classification, experience cannot determine which among the numerous conflicting conceptual schemes that are internally consistent and empirically adequate correctly describes reality. Nominalists hold, then, that the choice of a conceptual scheme is determined by knowers' interests rather than by objective features of the world.<sup>7</sup> For them, talk of truth and falsity is possible only within a framework of laws and general concepts, and any such framework is justified either because claims made using it can be reduced to claims about individuals or because it provides a useful tool for anticipating experience.<sup>8</sup> Either way, for nominalists, laws and general concepts are artefacts of economizing minds to which nothing in reality literally corresponds.

Nominalists typically claim that the individual experiences that provide the foundation of knowledge are private. As a result, they view epistemology as charged with the task of explaining how representations of reality can be known to be true when knowers can never get outside those representations to compare them with things as they are apart from thought. Some nominalists conclude that adequate justification of knowledge claims is impossible – they are agnostics or sceptics about the world external to thought. Others argue that reality is exhausted by minds and their private representations – they are idealists or solipsists.

The nominalists' conception of knowledge informs their account of human faculties other than cognition. While they view the faculty of reason as devoted to making sense of experience, they take the faculty of desire, or the will, to motivate cognition and determine the ends to which knowledge is put. For them, the capacity for human desire is limitless, while the resources available for attaining desirable ends are finite. Thus agents must prioritize their desires according to their intensity, their contribution to the fulfilment of other desires and the cost in time and effort required to satisfy them. Nominalists insist, however, that nature and experience are free of values, and a variety of choices of ends is consistent with the same understanding of facts. Whereas the domain of reason is objective, the domain of desire is subjective. Assessments of the value of

<sup>7</sup> '[N]ominalists generally do not admit that there is any similarity in things apart from the mind; but they may admit that this exists, provided that they deny that it constitutes any unity among the things apart from the mind. They cannot admit the latter and remain consistent nominalists' (6.377, 1902).

<sup>8</sup> 'Roughly speaking, the nominalists conceived the *general* element of cognition to be merely a convenience for understanding this and that fact and to amount to nothing except for cognition, while the realists, still more roughly speaking, looked upon the general, not only as the end and aim of knowledge, but also as the most important element of being' (4.1, 1898).

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ends are rooted in associations of pleasure and pain with various experiences, and these assessments cannot be justified by appeal to features of things that exist independently of reactions to them.

While nominalists consider reason and desire to be independent faculties, they do not deny that they often work in concert. On their view, the failure to achieve desired ends is both the mechanism of, and main motivation for, learning. Moreover, they claim that reason provides reliable expectations about the future and thus helps agents reconcile their unbounded capacity for desire with the constraints imposed by nature. The resultant harmony (called 'adaptation') is, according to nominalists, the only objective measure of individual well-being. Still, they insist that the contribution of reason to well-being is confined to determining the likelihood of fulfilling desires under various circumstances (through the prediction of the outcomes of actions), discovering the means by which desires might be fulfilled (through the control of events) and pointing to inconsistent desires (through the application of logic). Reason can ensure the conformity of beliefs to reality (problems of overcoming scepticism aside), but it cannot provide an objective assessment of the moral worth of ends. Desires, by contrast, are subjective expressions of individuality with no real objects to which they might correspond. Value is not a determinant of desire, rather objects are valuable only in so far as, and indeed because, they are desired by someone. To think otherwise, is, on their view, to reify subjective tastes as objective facts and take what one wishes to be the case to be evidence of what is.

Though nominalists view desires as non-cognitive, they do not view them as entirely inscrutable. They think reason can treat desires, indeed all mental contents, as phenomena to be explained like any other. That agents have the desires they do is a fact about them, and nominalists view it as part of reason's job to link such facts to other facts in lawful ways in order to understand them. On their view, knowledge of preferences and beliefs, the laws by which these are formed and the laws of rational choice would suffice to predict and explain an agent's actions. However, since these explanations are purely descriptive and are couched in terms of immutable, deterministic laws, they raise important questions for moral theory about how to account for the normative authority of moral judgments and how to make sense of the notions that agents have free will and are responsible for what they do.

The conception of human beings as utility-maximizing agents forms the basis of nominalist social philosophy. Nominalists view communities as aggregates of autonomous, self-interested individuals. On their

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account, the communal good is merely the sum of the welfare of the relevant individuals. The primary social institution is the state, inaugurated and empowered through the consent of the rational individuals it governs. Its function is to mediate antagonism among citizens and provide a stable arena for the pursuit of individual desires. The goal of the state is to ensure the maximum level of freedom (that is, the absence of the control of individuals by alien wills) consistent with personal security. Nominalists think it falls to the social sciences to discover laws of human behaviour on which to found institutions capable of regulating human interactions to the optimal benefit of each citizen.

Nominalists insist that, even when grounded on scientific principles, institutions remain creatures of convention. The limits of state authority are established through contracts secured among individuals with shared interests. The overlapping desires which make such agreements possible do not reflect a rational consensus on the collective good – there being no objective ends. Social groups, political and otherwise, are created and sustained by alliances among individuals who participate in them as a means to fulfilling private desires. According to nominalists, then, human beings are social animals, if at all, only as a consequence of the contingent coincidence of individual desires and not by virtue of any inherent gregariousness.

## THE EVILS OF NOMINALISM

The account of nominalism I have given extends well beyond Peirce's discussion of it. But the suggestion that he is concerned to refute this worldview is not mere speculation. The views described had broad currency in his day, and my summary fits well with his characterizations of nominalism as a systematic philosophy. More telling still is the fact that when Peirce's objections to nominalism are considered together, they provide a comprehensive critique of this philosophy.

Peirce's general complaint against nominalism is that it limits the scope and authority of reason and thereby yields far too much to scepticism in science, ethics and religion. He thinks nominalism restricts the kinds of questions that can be investigated and limits the kinds of answers to questions that can be offered and in so doing inhibits the progress of inquiry.<sup>9</sup>

Peirce objects, for example, that nominalists are incapable of providing a logical foundation for the quest for predictive laws in science. They

<sup>9</sup> Peirce thinks, '[i]t is one of the peculiarities of nominalism that it is continually supposing things to be absolutely inexplicable' (1.170, c. 1897).



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hold that experience is a disconnected sequence of independent sensory elements and no accumulation of evidence of this kind can justify claims to know the future.<sup>10</sup> For them, induction from past experience is rooted in habits of association rather than sound principles of inference. On this view, subjects engaging in counter-induction, though imprudent and prone to extinction, do not sin against logic.<sup>11</sup>

Peirce thinks the nominalist view that laws are either useful fictions or compendious descriptions of series of individual experiences also fails to explain why phenomena occur in patterns that can be formulated as laws.<sup>12</sup> This question is viewed by nominalists as either beyond the limits of human knowledge, as nonsensical or as a matter of brute inexplicable fact. Peirce thinks that the most nominalists can say is that objects happen to be perceived by knowers as similar in certain respects and that certain expectations of future experience become engrained as habits given repeated predictive success. However, this is merely to restate the fact that there are lawful regularities in experience, not to account for it. Peirce thinks that in failing to explain the predictive success of science, nominalism fails to provide rational grounds for the search for laws governing phenomena.<sup>13</sup> As he sees it, nominalists rest content with saying that scientists search for laws because their minds are built to do so, and this search has, as a matter of fact, been fruitful in the past. However, he thinks that in denying that any deeper justification of the search for laws is possible, nominalists merely close off inquiry into the foundations of scientific inquiry.

<sup>10</sup> Peirce claims that for Mill, for example, 'facts are, in themselves, entirely disconnected, and that it is the mind alone which unites them. One stone dropping to the earth has no real connection with another stone dropping to earth. It is, surely, not difficult to see that this theory of uniformities, far from helping to establish the validity of induction, would be, if consistently admitted, an insuperable objection to such validity. For if two facts, A and B, are entirely independent in their real nature, then the truth of B cannot follow, either necessarily or probably, from the truth of A' (6.99, 1902).

<sup>11</sup> 'According to the nominalistic view ... the only respect in which a system of ideas has more value than the sum of the values of the ideas of which it is composed is that it is compendious; while, according to the realistic view, this is more or less incorrect depending upon how far the realism be pushed' (4.1, 1898).

<sup>12</sup> He thinks the nominalist 'ought to admit no general law as really operative ... He ought to abstain from all prediction, however qualified by a confession of fallibility. But that position can practically not be maintained' (5.210, 1903).

<sup>13</sup> Peirce says, 'a nominalist may admit that there is in the events themselves an agreement consisting in the uniformity with which all stones dropped from the hand fall to the ground; but if he admits that there is anything at all, except the mere fact that they happen to do so, that should in any sense *determine* the different stones to fall every time they are dropped, he ceases to be a good nominalist and becomes a mediaeval realist' (6.377, 1902). See 8.144–54, 1900 and 6.273, c. 1893.



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On Peirce's view, a further threat to the legitimacy of science arises from the nominalists' approach to explaining thought and action. For them, understanding reasoning is a matter of uncovering the conditions in which, and the mechanisms by which, general laws and concepts come to be formed through the association of ideas. However, Peirce insists such explanations lack any normative force. He claims the laws of association are indifferent to questions of validity – they apply equally to legitimate and illegitimate (i.e. fallacious) associations. As a result, appealing to these laws as a justification of the scientific method merely goes to show that human beings, as a matter of fact, develop general conceptions of the world and attach the epithet 'true' to the more reliable results. It does not show that they are right to do so.

In so far as nominalists take thought to be governed by deterministic laws, Peirce thinks they are forced to deny the possibility of genuine deliberation. Inquirers are reduced from autonomous, wilful reasoners to arational computing machines. On such a view, he claims, errors must be seen as inevitable and beyond the control of knowers. If, in addition, reasoning is viewed as a physiological process, then, he claims, nominalism fails to account for cognition in its own terms. Thought is viewed as governed by mechanisms that do not countenance meanings as explanatory variables. Intellectual history is reduced to the interplay of physical forces, rather than a matter of the growth of ideas (WI: 88, 1861).

Peirce thinks the nominalist view of science is further flawed inasmuch as it cannot justify its reliance on psychology and biology as foundational in philosophy. As he sees it, nominalists defend their epistemological principles by appeal to theories of the mind and experience that are justified by applying these same principles. As a result, he maintains, the principles of the nominalist theory of inquiry are presupposed in their own justification, leaving nominalism an edifice that 'floats on air' (8.158, 1901).

Finally, Peirce insists that the nominalist account of knowledge leads to scepticism. He argues that if, as the nominalist maintains, private experiences are the sole objects of immediate knowledge, then the claim that science yields truth about an extra-mental reality is baseless. The result, Peirce maintains, is to call the epistemic credentials of science into question and undermine the adoption of truth as even a regulative ideal.<sup>14</sup>

For Peirce, the inadequacy of nominalism as an account of knowledge is compounded by its threat to the idea of an objective moral order.

<sup>14</sup> Peirce calls Spencer's concept of the 'The Unknowable' – a realm of being independent of, and inaccessible to, the world of experience – 'a nominalistic heresy' (6.492, c. 1896). See also W2: 239–40, 1868; W2: 462–3, 1871; 5.525, c. 1905; 5.553, 1906; 6.95, 1903; and 6.108, 1892.

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He thinks nominalists are committed to the view that the general concepts involved in ethical claims are, like all general concepts, defined by social conventions that lack any objective basis. Moreover, he claims, nominalists deny that there are final causes on which to base objective judgements about the value of ends. The uniformities they appeal to in making sense of experience are merely mechanical, not teleological. Given their view that science provides only knowledge of what is the case and no moral conclusions can be derived from purely descriptive claims, Peirce thinks nominalists must view questions about the worth of ends as outside the scope of rational inquiry (W1: 88, 1861). What is more, he thinks the nominalist view that values are rooted in subjective feelings of pleasure and pain conditioned to value-free stimuli implies that even acts of charity and altruism are to be explained in terms of the drive to satisfy individual arational desires. This account of morality, he maintains, represents an unacceptable reduction of commitment and conscience to the pursuit of self-interest.<sup>15</sup> Finally, Peirce objects to the nominalist's explanation of the formation and persistence of values in terms of psychological laws. As in the case of beliefs, he thinks such explanations are normatively insignificant since the same principles are invoked to explain the saintly and the satanic. He also holds that in so far as nominalists' explanations of values are deterministic, they undermine the idea that ethical judgements are the result of genuine deliberation. As a result, he thinks nominalism fails to provide an acceptable account of moral experience and agency.

Peirce's objections to subjectivism in moral theory underlie his criticism of nominalist social theory. For the nominalist, the laws that mediate conflicts among individuals are conventional, and their authority is limited to those who consent to be bound by them. This consent is said to be rational only to the extent that it furthers each individual's private ends. As Peirce sees it, the nominalist's denial of any overarching universal good that can provide a cognitive foundation for the organization and formation of communities and institutions is both immoral and unfounded (W2: 487, 1871).

The nominalist's view that the worth of institutions is measured by their contribution to the fulfilment of individual desires implies that institutions devoted to the pursuit of knowledge are valuable only in so far as they provide means for pursuing individual self-interest. Peirce objects that such a view makes science the handmaiden of desire and limits its focus to matters of social and individual concern. Nominalists fail

<sup>15</sup> See W2: 487, 1871 and W2: 336, 1869.