**Empiricism or Pragmatism?**

**Ernst Mach’s Ideas in America 1890-1910**

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**Introduction**

Ernst Mach’s influence on American thought was certainly very great and has already been documented at some length by John Blackmore (1973), Gerald Holton (1992) and Friedrich Stadler (2001) among others. Mach, who had considered emigrating in his teens, and who called America the “land of my deepest longing” saw the New World as a fertile ground for the elimination of metaphysical and historical baggage in philosophy and science, as he said in a foreword to his “Antimetaphysical Remarks” published in the very first issue of the *Monist* in 1890: “The time seems ripe for the overthrow of all metaphysical philosophies. I contribute this article in the confidence that America is the place where new views will be most fully developed.”

I will take it as established that there were some natural affinities between Mach and American thinkers, and focus instead on differences. In fact, the American reaction was surprisingly critical. I focus on the period of 1890-1910 and specifically on the tension between American pragmatism and Machian empiricism. The main figures of my story are Paul Carus the editor of the *Monist* and a philosopher in his own right, Charles Sanders Peirce and William James, the New American Realist movement, and a surprising case of “parallel evolution” in the work of the Cincinnati lawyer and judge J.B. Stallo. In presenting Mach’s views, I refer the reader to my in-depth studies of his philosophy and science (Banks 2003, 2014).

**Paul Carus**

Paul Carus (1852-1919) was born and educated in Germany and was a student of Hermann Grassmann. He emigrated to America where he became involved with the Open Court publishing company in LaSalle IL, near Chicago, and began editing the journal the *Monist*. Carus was crucial in getting Mach’s works translated and making them available for the American reading public. The translations, most by Thomas McCormack, are readable and accurate and even preserve some of Mach’s characteristic locutions.

Carus stayed in regular contact with Mach from the late 1880s onward and visited him in Prague in 1893 and in Vienna in 1907. He also made repeated, persistent attempts to clarify Mach’s philosophy of science in various articles for the *Monist* and published some of Mach’s replies from his correspondence. Carus, a trained philosopher, was a monist himself and the author of a self-styled “religion of science” with the formal, Eleatic Oneness of Nature substituting for a religious ideal. He also made a serious attempt to criticize Mach in the spirit of reaching a deeper understanding. This criticism concerned two main things:

1. The nature of Mach’s neutral elements-cum-sensations

2. The status of abstract forms, concepts, theories and the formal “unity of science” vis a vis Mach’s ideas about the Economy of Thought.

Mach is of course known for his “neutral monist” view of sensation, in which the same element, a sensation of blue, is also a physical event under a different set of physical variations (Mach 1959 orig. 1886). The question remains: is every physical element also a sensation, making Mach a kind of sensationalist even about physics? Mach’s critics, like Vladimir Lenin, thought so, although James and Russell, and the American Realists, did not fall for this misreading at all. It must be said that although Mach said sensations were elements first and sensations second, and pointed to the existence of unsensed sensations in other minds and physical objects (for which see Banks 2003) he was often very unclear, using the word “sensation” when he seems to have meant “element.” In a 1893 piece, Carus recalls the meeting in Prague when this question of words came to the fore:

When several months ago I met Professor Mach in Prague…he assented to my speaking of scientific terms as abstracts…But when I proposed that the term ‘sensation’ also was according to my terminology an abstract term presenting one feature of reality only and excluding other features, Professor Mach took exception to it, saying that he understands by sensation reality itself. If, as Professor Mach uses the term, sensation is another name for reality, the main difference between our views appears to be removed.” (Carus 1893, p. 299)

I think Mach is finally admitting that sensation is just his term for the really existing concrete natural elements, whether or not they are individual sensations. The term sensation is, in short, a metaphysical term for the individual events that concretely exist in nature, *some* of which are human sensations. With the admission that Mach’s elements are actually more than *mere* human sensations, the debate over words seems to have dissolved to Carus’ satisfaction.

Carus also wanted to know what Mach thought about formal laws and abstract theories in science. Were they really just economical devices and aids to memory rather than true forms inherent in nature? He wrote:

While I have no objection to Mach’s description of science as an economy of thought, I would hesitate to say that it is sufficient as a definition, because science is a correct (or adequate) description of facts in their essential features. Exactness, correctness, adequacy, truth, or whatever you may call it is the main thing and comprehensiveness comes in second as a natural consequence whenever the essential features have been rightly understood. I try to explain why…there is a feature in experience itself that justifies the formulation of theories…the purely formal is not merely a matter of method, it is not purely subjective, but must be a feature of the objective world. It explains why there are uniformities. (Carus 1906, pp. 336-337)

Thus, Carus can accept some kind of “second order” economy of thought that seeks to unify the greatest number of empirical laws under the fewest theoretical laws and principles, but rejects the idea that the formal or lawlike side of nature is itself a mere product of the economy of thought. Carus (a student of Hermann Grassmann who advanced a whole theory of abstract form in the beginning of his *Ausdehnungslehre*) emphasized the need for all laws to harmonize essentially into one, which mere economy could not guarantee, and would even perhaps discourage. Many others did as well, including Charles Sanders Peirce, seeing Mach’s philosophy as totally inadequate to explain the importance of formal abstract concepts and how they seem to model the real, formal aspect of nature.

**What *Was* Mach’s Economy of Thought?**

Economy of thought is a very deep issue in Mach’s philosophy and requires extensive explanation. The short answer to Carus is that Mach *did* of course recognize the role of mathematical form in nature, and did emphasize that individual elements are mathematical functions of each other (perhaps relating their intensity) and are thus bound together in functional complexes. Unlike in Hume’s philosophy, elements cannot occur *except* in relations with others, although the form the functional relation takes cannot be anticipated a priori, nor is the form possessed of any a priori certainty beyond that given by experience, as Kant would have it. Objects and egos are but crude aggregates or agglomerations of elements that are constantly changing: the functions that were really behind these objects all along take on this role of the “real objects,” as Mach emphasized in the *Analysis of Sensations*. They could, for example, be temporarily closed systems of elements united by a function, f(a,b,c)=0, an example Mach used often. The conservation of energy is, in Mach’s view, simply a way of stating “the mutual (functional) dependence of phenomena on each other,” which is certainly a formal principle. He stuck to this idea from the *History and Root of the Principle of the Conservation of Energy* (1872) all the way to his most mature scientific works, stating it again and again as a kind of musical coda to each of them.

However, Mach was also very clear that many of the most basic scientific concepts, especially these, are probably abstractions or even falsifications of direct concrete experience: absolutely enduring objects, frictionless planes and perfect spheres, but also absolutely repeatable, cyclic events, exact symmetries, and especially the spatio-temporal form of objects and processes which he felt was a superficial way of understanding the underlying reality of elements and functions described above and ceded too much ground to mathematics and to our psychological processes of visualization (“metaphysics”).

Especially in his essay “On the Economical Nature of Physical Inquiry” of 1882 (contained in Mach 1895) Mach’s basic skepticism about these perfect, smoothly-machined, concepts of physics is undeniable. Is there such a thing as perfect cyclical repetition, or symmetry, or do we simply demand that events take that form convenient for our understanding and the application of mathematics to nature? If I read him right in my 2003 book (pp. 131-134), Mach even considered the idea of making the second law of thermodynamics (for irreversible processes) foundational because of the impossibility of perfect cyclical repetition in nature, rejecting both the cyclical Carnot process and even the conservation of energy as abstractions.

Notice the inversion of Kant’s synthetic a priori principles of natural science. Kant had insisted that if a concept, or judgment involving concepts, or a principle for forming judgments, was sine qua non for any scientific inquiry into experience, e.g., ideas of number, degree, conservation, sequence, the concept also had an epistemic a priori necessity and made science possible. Mach pulled up that argument by the roots and cast basic doubt on the epistemic foundation of those Kantian principles while still admitting their a priori status in the order of our thinking about nature, or the historical course of ideas in their development. These ideas have an a priori status in our thinking or methodology or history of a discipline like mechanics, but this does not mean they rest on a more certain foundation than experience or economical idealization. They may even be *more* suspect because they are unexamined. We may be forced to assume certain ideas in order to think or experience events, and they will appear to take an a priori position in the logical order *relative* to other ideas, but not absolutely so. As in much else, one can see quite clearly here how Mach’s ideas have evolved directly from his criticism of Kant’s synthetic a priori principles of natural science. (He is actually quite close to Nietzsche here, a connection that has interested several recent scholars including Pietro Gori.)

However it is also true (this is a point Michael Stöltzner emphasizes) that Mach said the scientist may discover real patterns or “the same great facts” stretching over many domains of inquiry, as long as these principles are said to rest upon experience alone. So as abstractions they can make infinite claims about future experience and be true generalities on one hand but they only rest upon finite evidence or cases and can be overthrown in the future. This is what I think Mach meant by saying that in an evidentiary, and even an ontological sense, there is no law of refraction only those cases of refraction that instantiate the law. A better example would be his use of potentials as effective general abstractions, while emphasizing that only potential *differences* (expressed in forces, or equilibrium of forces) are concretely real (for which see Banks 2003).

It is not widely known that Mach used abstract principles and laws often and thought the abstract phenomenological laws of thermodynamics could be an example of laws of great generality, completely independent of what domain of physics they are realized in, hence his hostility to the idea of basing thermodynamics on mechanics and not the more fundamental excluded perpetual motion principle, which he believed, in turn, evinced a general law of causality or functional dependence of phenomena on each other, as he says in his 1872 Treatise on the *Conservation of Energy*.(Mach 1910, orig. 1872)

It is also true that for Mach “nature forms one whole” a remark which delighted Carus as well as puzzling him. This means that there is actually a formal “coherence of nature” principle operating alongside Mach’s injunction to consider only concrete elements and cases as really existing and the fact that “nature is but once given.” I think this overall formal coherence is the order of functional connections between events for Mach, not the order of economical abstractions. In so far as economical abstractions do hold as real regularities they depend upon the deeper order of functional connections among the elements. If not, then the economical abstraction may be a simple aid to memory or a provisional device for talking about objects or other semi-permanent complexes, founded in biological need or ease of visualization.

Even if real regularities are reached, nothing whatever indicates which laws should be sub-ordered to which, or which laws truly run the deepest, and here another second order notion of economy comes into play. There are a few candidates for the ultimate abstract laws, great facts like the laws of thermodynamics and the law of least action. Why these basic laws hold is “unintelligible” but they are unintelligibilities with which we have become so historically familiar that we have ceased to see them as unintelligible. If other laws took their place, it could be these laws could then be explained, but only the assumption of further unintelligibilities (Mach 1910 orig. 1872 p. 55-56). There are, in fact, two prominent examples in Mach’s work of trying to flip or invert the order of principles to arrive at a new scheme:

1. Principle of inertia, statics for dynamics. Mach inverted the order of Newton’s laws deriving the principle of inertia from the principle that forces induce accelerations, the logical converse of which is no net external forces = no accelerations, so when forces cancel for example in a dynamical equilibrium the result is no acceleration, so rest or uniform motion. As Mach also emphasized, D’Alembert’s principle deduced statics from dynamics, by interpreting accelerations as inertial forces balancing the effective forces on a mechanical system. Again statics, which seemed more fundamental than dynamics, is actually less fundamental when their roles are inverted.

2. Mechanics and thermodynamics. While most scientists sought an explanation of thermodynamics from mechanical principles, Mach, again, sought to invert the explanation, using thermodynamic and electrostatic analogies (of potential functions and potential levels) to interpret the deeper meaning of mechanical laws (masses being analogous to charges and quantities of heat and distances, or velocities, as analogous to temperature or voltage). Could thermodynamical concepts be prior to mechanical ones? (Parenthetically, it is interesting to think here of DeBroglie’s conjecture that Planck’s constant h suggests a fundamental unit of entropy, not further reducible to a mechanical explanation of disordered motion. If so, then mechanics is actually a manifestation of thermodynamics, not the other way around.)

As Mach said, “where we stop,” or which regularities we logically deduce from which is a sort of economical decision and will indeed revolve around questions of parsimony of assumptions, or even convenience, or historical acceptability and continuity with the past. It is in the sorting out of these patterns or overall “super laws” or great facts that the economy of thought is really applied by Mach.

It is well known that Mach wanted to disrupt the convenient assumption of basing physics on mechanics, which he regarded as a historically and psychologically conditioned conception, based on the fact that we are most comfortable with mechanical experiences of bodies moving in space and time and find these things easier to visualize and describe mathematically. This in no way indicates that mechanical ideas really do run deepest, merely that we *make them do so* relative to our other possible orderings of laws. It can therefore happen that some laws come to *appear* a priori because of the relative deductive position they assume relative to other laws. Some laws that lie very deep or high in the order, such as principles of symmetry and conservation, may even seem a priori to all others as Kant held. But again, for Mach this relative position of laws, or priority with respect to each other, does not give them any extra necessity or *evidentiary* weight as it does for Kant. Even the most abstract postulates still rest for their *evidence* upon experience and not on any prior notion of formal unity and structure of nature. This is a very important point.

Consider one of Mach’s famous examples, the transitivity of mass. One would think that transitivity is so basic or bedrock a property that any bona fide physical property would be guaranteed to have it a priori. Mach however in his definition of mass imagined three masses on a frictionless ring colliding by impact. Mass A collides with mass B which collides with C and then C collides with A again. We think the transfer of momentum and energy is a priori certain to be transitive, but there is no actual guarantee of this and it does not follow logically; it must be explicitly assumed as a *further* fact, in addition to other facts. It is a very clever insight and was deployed by Mach not to demolish abstraction or form but to deny form any extra a priori evidentiary power in science. I believe Mach could well be given credit for a philosophical breakthrough here, destroying Kant’s ideal of what he called “synthetic a priori principles of pure natural science.” According to Mach there simply is no such thing.

So to sum up, Carus thought the formal reality of nature was somehow out there to be discovered as a fact; Mach accepted the reality of form but always grounded it, both ontologically, and in an evidentiary sense, in experience, i.e., the concrete behavior of the elements in functional relationships that are likewise empirical.

**Charles Sanders Peirce**

Peirce (1839-1914) was the son of the mathematician Benjamin Peirce and was himself a practicing scientist and a prominent logician. Peirce worked in astronomy, measuring the brightness of stars and in geodesy, mapping the gravitational field of the earth for the U.S. Coast Survey, at the time the premier scientific institution in America. Peirce was actively involved in philosophy as evidenced by his two best known papers written for the *Journal of Speculative Philosophy*, the “Questions Concerning Certain Faculties Claimed for Man” and “Some Consequences of Four Incapacities” both in 1868. He also attended meetings of the so-called Metaphysical Club in Cambridge, Mass and it was here in 1872 that he read a paper William James later remembered as containing the germ of what became American Pragmatism, probably containing points from his later papers on the “Fixation of Belief” of 1877 and “How to Make Our Ideas Clear” of 1878.

In Peirce’s first set of papers in the 1860s, he attacks Descartes, critiques the idea of an innate power of introspection and develops the idea that self-consciousness arises as an induction from experience and is not a logically prior notion underlying experience. There are Machian themes here. Even the distinctions between so called outer and inner sensation is inferred, not given, and one might say that for Peirce experience is a kind of neutral field which we learn to divide up into subject and object, inner and outer, sensation and form, by remembering and mastering the variations we find in experience. Even sensation itself, the momentary present experience, is not immediately present to the mind for Peirce but has to be abstracted by considering shorter and shorter durations.

Peirce clearly anticipated aspects of Mach’s and James’s later neutral monism. I have assumed that Mach was the main influence on James through the Analysis of Sensations (Banks 2003, 2014), but Peirce’s neutralism may well have been an independent line of influence.

For Peirce, all results drawn from experience are strictly speaking inductive and follow from the application of various inductive and hypothetical methods of reasoning—a hodge-podge subject philosophers still call (a bit confusingly) “inductive logic.” Peirce conducted a lifelong study of inductive-hypothetical methods in science and in philosophy and this led him more or less directly to what we now call American Pragmatism.

What *is* Pragmatism and how does it differ from Machian empiricism? A maxim often taken to define pragmatism is that two concepts that have exactly the same practical applications and consequences for science have no reason to be distinguished, despite the fact that the concepts may yet be metaphysically different. Peirce offers as an example the vector representing both force and the accelerating particle in “How to Make Our Ideas Clear.” For Peirce, the idea that there is a further metaphysical distinction to make between force and the accelerative effects of force expressed in motion is a pseudoproblem. As yet, it isn’t particularly clear how this would differ from empiricist verificationism or the underdetermination of theories by empirical evidence. Mach said such things about non-testable differences as well, but he took a different view of this example, claiming that Newton’s second law is not a mere tautology but an important *empirical* law linking the presence of a force to the manifestation of accelerating masses. A force, for Mach, is an equalization of some existing potential difference, for example the potential energy of a body raised against gravity. In that sense, one can compare natural potential differences to each other and there is no reason why, for example, potential differences in height might not have equalized according to Fourier’s law instead of Newton’s (whereby differences of temperature “potential” are equalized by the “velocities” of heat flow). Or third and higher derivatives of position for that matter. Evidently an impractical metaphysical question for one person may well be regarded as empirically meaningful for another!

Pragmatism however, as Peirce understood it, is rather the idea that a priori philosophical theory of knowledge (as in Descartes or Kant) should be replaced by the inductive-hypothetical methods of the working scientist. Science is not a body of results and assumptions but a working method and scientific truth is nothing but the results our best methods can deliver over time leading to belief and confidence. Hence Peirce’s often ridiculed idea that truth is the “ideal end of an infinite scientific inquiry.” Hilary Putnam, following Paul Feyerabend, later attacked this view calling it “method fetishism.” The fatal flaw of the view of course is that it assumes we already possess the correct methods of investigation and need only apply them infinitely many times.

I see this essential link between truth and method as the basic cornerstone of pragmatism in America, not the so-called “pragmatic maxim.” And it does perhaps reflect a sort of scientific optimism very much in line with Peirce that the right methods will deliver the goods eventually, not through pure a priori thought, or synthetic a priori first principles (with which Mach would have agreed). In more recent times, American philosophers like Davidson and Putnam offered sophisticated variations on this Peircean idea that truth is inseparably linked somehow to our best rational methods for discovering truth, while remaining a method-dependent, and method transcendent ideal of sorts. Davidson for example links truth with intentionality and rational decision theory. The political philosopher John Rawls likewise defines justice as the outcome of a “fair process.”

Peirce reviewed Mach’s *Science of Mechanics* in 1893 for the *Nation* magazine (Peirce 1893) and we can see here exactly what he thought of Mach’s views. Peirce took issue with Mach’s historico-conceptual criticism, his economy of thought, and what he perceptively saw as Mach’s imposing his own empiricist-nominalist metaphysics on science while claiming all the while to be “metaphysics free.”

Elsewhere, Peirce said: “Dr. Mach who has one of the best faults a philosopher of science can have, that of riding his horse to death, does just this with his principle of the economy of thought” (Peirce 1931 p. 122). Peirce’s critique of economy seems to be two fold: 1. Abstraction and generalization from individual experiences to abstract laws and concepts, is not merely for the purposes of book-keeping or economy, to replace a list of experiences with a single heading. The abstraction, the discovery of laws and applicable concepts, is actually the *goal* of inquiry and not simply to catalogue sensations, but because the laws and concepts are provisionally true (in the pragmatist sense of “following from our best methods”): there are precise natural laws and objects like atoms which can be guessed at and even concluded as a result of an inductive-hypothetical inquiry. 2. The individual, vanishingly brief, sensation is an abstraction as much as any other and “is known to us only inferentially.”

Regarding Peirce’s point that the element is an abstraction, Mach was also quite clear that the elements are provisional and can always be divided further, so they are by no means immediately given to individual knowers. Yet even in the complex way in which they are given, they are concretely real and not an abstraction, this is probably why Mach resisted Carus on that point. But Peirce was right to say that the neutral elements are a genuine metaphysical assumption although Mach would not have admitted it, until pushed by Carus to do so.

There is one other criticism Peirce makes and this has to do with Mach’s rather dim view of official, codified scientific methods and his belief that those methods are based upon pre-scientific biologically or evolutionary instincts, for permanence, for repetition, for clear psychological visualization, human “intelligibility” in other words. Mach is the forerunner of today’s philosophical naturalists who see science itself in the context of human evolution and brain science. Also, in making non-rational instinct the precursor of high sounding ideas of permanence, conservation and symmetry, Mach is close to Nietzsche as pointed out above.

Peirce points out sharply that Mach’s view of inquiry is too passive, too one-sided, as experience imposes itself upon the human mind and accommodates thoughts to experience and thoughts to each other. Peirce disagreed very strongly with this. For him, hypothetical and inductive methods are *active*, based upon norms of reason, similar to those of deductive logic, and are *not* founded upon human psychology or pre-rational behavior. Abstraction is part of that essential process Peirce called abduction, where general hypotheses are essentially guessed and then tied to the experiences the guess would allow you to predict. They cannot be directly “induced” from a multitude of experience themselves. Mach might have agreed: he didn’t think much of induction in science either and emphasized the role of abstract thought experiments (such as excluded perpetual motion and the role it played in Stevinus’ chain argument, or the role of reversible Carnot engines in thermodynamics). These are certainly not inductions from experience. It’s also clear however that however abstract principles are *arrived at*, they do not really “go beyond experience” in their evidence for Mach. They have no special Kantian synthetic a priori certainty qua abstract principles or norms, and the same goes for maxims of inquiry. As a fallibilist, Peirce might have agreed with that as well.

But Mach would never have shared Peirce’s all too American optimism in the success of scientific methods in delivering results in the long run. Mach it is true made many studies of the different pathways of inquiry, historical and conceptual, in *Knowledge and Error* (1905) most notably, when he returned to Vienna to take up the Chair of History and Philosophy of the Inductive Sciences (a forerunner to our “HPS” programs of today). But, as Mach often emphasizes, the same methods that lead to knowledge *also* lead to error and there is no guarantee which will be the result, besides success. At the end of the day therefore Mach was *not* a pragmatist; he was still an empiricist who saw experience as the external arbiter of both truth and methods.

**William James**

Mach and James were both professionally engaged in sense psychology and physiology in the 1880s. James was writing his two-volume *Principles of Psychology* (1890-1) and, after a stint in university administration, Mach was putting the final touches on the *Analysis of Sensations* (1886) which was the culmination of work dating back to the early 1860s. These two figures met personally in 1882 in Prague for a conversation that must have been delightful (for both accounts, see Hentschel and Blackmore 1985 and Thiele 1978).

It is clear that James’s version of Pragmatism was too much for Mach, as it would have perhaps relativized truth not only to scientific methods, as with Peirce, but still more general methods and interests, so much so as to admit pseudoscience, or “Spiritualismus und Schwärmerei.” (Hentschel and Blackmore 1985, 63). Mach avoided the issue, merely suggesting to James he needed to read the book again and think about it some more. In James’ defense, his pluralism of methods and of pragmatic truth is usually misconstrued; James did *not* claim to put all methods on the same footing or to embrace epistemic or cultural relativism about truth. Different methods will deliver different goals and objects, but they are not all equal in what they deliver. It also may be that for James, truth itself is many sided and not a monistic coherent structure, for which more below.

I suggest the real Mach-James connection should be sought in James’ developing Radical Empiricism and not really in James’ Pragmatism at all, hence Mach’s tepid response to the latter. We have a letter from James to Mach (of 1902) in which he describes a new philosophy he is working up before his students, which will soon become the Radical Empiricist essays.

I am now trying to build up before my students a sort of elementary description of the construction of the world as built up out of ‘pure experiences’ related to each other in various ways, which are also definite experiences in their turn. There is no logical difficulty in such a description to my mind but the genetic questions concerning it are hard to answer. I wish you could hear how frequently your name gets mentioned and your books referred to. (Thiele, p 173).

Note: the word “pure experience” is a literal translation of *reine Erfahrung*, which was Richard Avenarius’ term for neutral sensation in the *Kritik der reinen Erfahrung*. Aside from the term, which may simply have caught James’ fancy as an inveterate word-collector, I can’t see much else here. James knew Avenarius personally as well, but the relation to Mach seems much closer than to Avenarius’s rather complex system.

Common to James and Mach is the idea that sensations, colors for example, are *real* facts about events occurring in the nervous system, and should be treated as neither exclusively mental, nor as physical, events, at least not in the customary sense of ‘physical’ which excludes experiences as “secondary qualities.” Mach reached these views in the 1870s having shrugged off idealist, phenomenalist and monadic (Herbartian) views. James’ road to the neutrality thesis is much less well understood.

In the 1890 *Psychology*, James considers a view called the “mind dust” theory, attributable to many different authors including W.K. Clifford. “Mind dust” is a compositional panpsychist theory in which each material object contains a grain of sentience or protosentience, such that when the grains combine physically into organisms they also combine mentally into experiences and minds. So the human experience of seeing blue comes together somehow out of various proto-experiences which sum up to blue somehow in the human nervous system. In the *Psychology*, James strongly rejects “mind dust” on the grounds that simply putting the materials of proto-sentience together would not assemble a mind any more that the thoughts of several people on the street can be combined into a mind or a team. Summing separate elements would not achieve the unity they achieve in consciousness, James thought. Moreover, each ego seems to be separate from all the others and fundamentally “unsummable” in some way with others.

However, by the Radical Empiricist Essay “Does Consciousness Exist” in 1904, James says that, just like Mach twenty years before, that he abandons this idea of consciousness fundamentally enveloping and segmented off our experiences. The blue one sees is also a physical event in the nervous system and would remain blue even if the other various functions of the mind, like memory, association, and reflex did not bind it in the context of a conscious experience. In place of the unified ego we have a collection of various functional connections ultimately realized in the brain and its activities, perhaps more like the mathematical composition of functions one inside another f(g(x)).

Mach of course had represented this view in psychology for many years and applied it to the phenomena of the Mach Bands, depth perception, and in his own rejection of Helmholtz’s vague unconscious inferences, in which Mach sees simply an innate reflex or evolutionary mechanism requiring no conscious thought and which, in fact, undergird acts of consciousness when they seem complex enough and unified enough to be designated as such. The collection of innate reflexes make up the functional conscious ego, not vice versa.

James was also in open revolt against Brentano and the mysterious “intentional” acts which separated experience from the physical realm. In James’ American Psychological Association address “The Knowing of Things Together” of 1895 later published under the title “The Tigers in India,” Brentano’s doctrine of intentional inexistence is under direct attack. Here James defends a causal theory of knowledge *and* error, before Mach’s book of that name appeared in 1905, in which intentional and representational links between mind and object are replaced by purely causal links which have no necessary relation to their objects but purely natural ones, including those that lead us astray when we make errors. James famously says later in “A World of Pure Experience” that purely external links between a mental image of Memorial Hall and the real Hall are what establish the ability of a picture to be about the hall or even to be similar to the Hall. Or in another famous example from “Does ‘Consciousness’ Exist?” James points out that a pure experience of a fire and a mental image of licking orange tongues of flickering light are both real experiences taken in themselves. It is only the external causal power of the one experience to “burn real sticks” and the link of the other with a fever or illness, or burning only mental sticks perhaps, that establishes the difference between the two. I have written on Jamesian direct realism elsewhere (Banks 2014) which I feel to be his most unique contribution to philosophy.

So, with the ego gone and the pure experience freed from any permanent association with the mental, there was nothing to prevent James from joining Mach and becoming what Russell later called a “neutral monist.” Indeed in my 2003 and 2014 books I argued for a Mach-James-Russell “movement” in neutral monism in the early twentieth century extending to today’s neutral monists in the philosophy of mind, including the present author (and see also Stubenberg 2016). But this is not the end of James’ evolution, there is also a problematic “next phase” which took him away from Machian monism for good and toward pluralism.

**James’ Next Phase**

Machian elements and James’s pure experiences both exhibit power or force, just like physical events do. This explains why they are functionally related to each other since the elements simply are concrete manifestations of power in events and affect one another as such, thus concretely grounding the functional relations in real causal relations (see also Banks 2014). For Mach this seems to have been a kind of triviality long known to physics, but for James, the concrete “concatenated” structure of reality was a further mystery to be understood by contemplating the workings of our own experience directly, or what he called “mental work,” to accompany the “energetic” work that bits of pure experience exert in their physical variations (an idea he picked up from Wilhelm Ostwald and the energetics movement and their theory of sensation as “forceful mental energy”). (James 1977 p. 181, Banks 2003 Chapter Nine). Of mental work James says:

Wherever the seat of real causality is, as ultimately known ‘for true’ (in nerve processes if you will that cause our feelings of activity as well as the movements which these seem to prompt), a philosophy of pure experience can consider the real causation as no other nature of thing than that which even in our most erroneous experiences appears to be at work. Exactly what appears there is what we mean by working, though we may later come to learn that working was not exactly there. Sustaining, persevering, striving, paying with effort as we go, hanging on, and finally achieving our intention—this is action, this is effectuation in the only shape in which, by a pure experience philosophy, the whereabouts of it anywhere can be discussed. Here is creation in its first intention, here is causality at work. (James 1977, 289).

James added to this a note that he was not contradicting his earlier writing in “Does ‘Consciousness’ Exist?” where he spoke of two orderings of pure experience, a mental ordering by psychological association and memory and a physical “energetic” ordering. The mental work is real but mental activity trains operate “by other parts of their nature than those that energize physically.” (James 1977, p. 285n). However, unlike the physical work, for which we consult motions and external effects, the “mental work” is presented to us directly in the phenomena of our own minds and open for direct inspection. For Mach this would have been fine as long as it is acknowledged that both sorts of work are ultimately to be unified in one set of elements and variations, not two mutually exclusive sets in a sort of extended or enhanced “physics of the future” that includes psychology as a subdomain. But James clearly would have none of it. Indeed, in a notebook fragment published by Gerald Myers, James says there is *no possible unified view*:

Apropos of my *reine Erfahrung*! Isn’t the difficulty of a simple smooth scheme uniting the subjective and the objective due after all to the pluralistic constitution of things? Everything is many-directional, many-dimensional, in its external relations; and after pursuing one line of direction from it, you have to go back and start in a new dimension if you wish to bring in other objects related to it, different from those which lay in the original direction. No one point of view or attitude commands everything at once in a synthetic scheme. Yet all things are continuous through the mediation of the fact that each of them is contiguous to some other or others.

To be more concrete, a sensible “experience” of mine, say this book written on by this pen, leads in one dimension into the world of matter, paper-mills, etc., in the other into that psychologic life of mine of which it is an affection. Both sets of associates are contiguous with it, yet one set must be dropped out of sight if the other is to be followed. They decline to make one universe in the absolute sense of something that can be embraced by one individual stroke of apprehension (Meyers 1986, 326).

Gerald Meyers devotes a long endnote to this question, himself referencing Ralph Barton Perry’s famous study of James:

According to Mach’s theory, sensations are neutral elements from which both mind and body are constructed. As Perry noted, Mach envisaged a construction modeled on physics. Perry described Mach’s theory and James’s response to it thus: “We find him defining the domain of psychology as the dependence of the sensations or elements on the central nervous system. ‘Decidedly not,’ remarked James in his copy of Mach’s *Analyse der Empfindungen*, for this could only mean the reduction of psychology, through psychophysics, to physics; while for James psychology had its own categories, scientifically as authoritative as those of physics and metaphysically more fundamental.” (Meyers 1986, 569 n.)

It would seem, then, that James’ pluralism and his disunity of nature finally separates him from Machian monism once and for all and that this was his final position.

**Ralph Barton Perry and the American Realists**

The American Realists were a group of Professors at elite American universities deeply influenced by both Mach and James. The group included Ralph Barton Perry, Edwin B. Holt, William P. Montague, Walter B. Pitkin, W.T. Marvin and E.G. Spaulding. In 1910 they published their “Program and First Platform of Six Realists” in the *Journal of Philosophy, Psychology and Scientific Methods* (Perry et al. 1910). Each man wrote his own set of “bullet points” and they then signed a statement that each version was designed to fit under a general umbrella.

The Six Realists all defend a Machian theory of the neutral elements and are clear that these will include elements that are not human sensations, the latter being a subset of the former. Perry saw Mach’s neutral monism as the crucial breakthrough to a realistic (*not* phenomenalistic) view of sensation and to one neutral order of elements. According to Perry, “Mach’s book the *Analysis of Sensations* deserves to be numbered among the classics of realism.” (Perry 1925, 79).

As Perry points out, however, the “functions” of Mach’s view are to be replaced by the new mathematical logic, especially the logic of relations, in order to provide a formal structure for the elements. Perry claims that Mach’s naturalistic and economical view of functional connections was insufficient to account for the formal mathematical side of nature (this issue again) and yet he (Perry) holds back from any sort of Platonic realism. (Perry 1925, 83)

While Mach’s statement of the theory is correct in principle, it is colored by the author’s naturalistic predilections. He neglects the logical aspect of knowledge. Physical and psychical complexes have in common not only sensible qualities, but also certain more fundamental formal relationships, such as implication, order, causation, time, and the like. These relations in their purity can be discovered only by carrying analysis beyond the bounds of sensible discrimination. They require, in short, logical analysis. (Perry 1925, 311)

Perry also breaks with James’s late pluralism. He and the other realists emphasize the Machian idea that the ego is a construction or a subset of relations within the larger set of relations of the natural elements. They also reject the privacy of mental experience, insisting that the sensation-elements are “open to all” no different from any other elements of nature. Perry also states that introspection is not to be the primary method of investigation of the mental, but rather the investigation of the mental relations themselves, and these should not be treated as if they are “hidden from view.” This strongly foreshadows the American behaviorist movement.

However, in yet another meaning of “realism,” Perry explains that because the sensation is also at the same time a physical element or event, it is possible to imagine that a perceived object extends all the way into the knower’s consciousness, as on James’ theory of direct, non-representative, perception. Bertrand Russell commented on this aspect of neutral monism as well in 1914, saying that Mach (and James) had performed “a service to philosophy” in explaining how part of external objects could be directly perceived in the mind as sensations (Russell 1984, pp. 31, 22). Yet it is also possible to group the mind-independent elements into a mind-external object, making representative, or indirect realism, true as well depending on which elements of the object we wish to emphasize. Perry points out the elegance of this solution to the problem of perception, in effect allowing for both direct and indirect realism.

**J.B. Stallo: A Case of “Parallel Evolution”**

In closing, I would like to mention J.B Stallo, who was born in Germany and emigrated to Cincinnati to pursue a career in law and to further his independent scientific studies. Stallo’s *The Concepts of Modern Physics* (1881) was a penetrating philosophical examination of the mechanical natural philosophy of atomistic matter and motion and Stallo himself uses the term “metaphysics” to describe this view and to declare his own “anti-metaphysical” position. Stallo even uses the word “metaphysics” in the psycho-physiological and historical sense of Mach, that is the unwarranted use of biological and psychological imagery and misleading visualization in natural science as well as historically conditioned ideas. For Stallo, just as for Mach, “metaphysical” does *not* mean that which is abstract, or hypothetical, or beyond direct verification. It means something completely different than what this term later meant in verificationist logical positivism. Stallo is the American thinker closest to Mach the physicist and critic of physics, although it is not a case of influence so much as parallel development. Was it ultimately Stallo more than the pragmatists who most convinced Mach that the American “soil” was ready for his ideas to take root, as indeed they did with the emigration of the logical positivists in the following generation?

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