While no serious physicist is inclined to approve of Stafleu’s stated intent with *Time and Again* “to prove that physics, as far as its foundations are concerned, is little more than time keeping” (preface), his conclusion that no other contemporary philosophy can give as thorough “a systematic analysis of physically qualified structures of individuality” (p. 224) is motivation enough to undertake a study of this book. In weighing his goal, it must immediately be noted that Stafleu understands time as a “lawful pattern of relations between things and events” (preface); in fact, lawfulness of the creation plays a central role in Dooyeweerd’s ‘Philosophy of the Cosmonomic Idea’ which Stafleu comprehensively and rigorously applies to physics.

The Philosophy of the Cosmonomic Idea (PCI) is a systematic framework for understanding the universe as a created unity in which no entity can be fully understood via reduction to a proper subset of the full ordered spectrum of mutually irreducible modal aspects, the first five of which Stafleu, following Dooyeweerd, takes as being numerical, spatial, kinematic, physical, and biotic. Others include psychic, juridical, creedal, etc.

Quite in agreement with modern physics (but for completely different reasons), it is central to the PCI that “there is no ‘substance’ which exists independently of law.” (p. 20) In addition, laws are the means by which God governs his creation, and the PCI envisions this governance as being carried out within the various modal aspects of reality. That is, certain laws apply to creation’s numerical aspect, certain other laws apply to its spatial aspect, etc. However, the irreducibility of any created thing to any subset of the entire range of modal aspects implies that, e.g., the functioning of numerical laws has consequences for the physical aspect as well, as we see when we are able to give physical theories mathematical formulation. This can be elucidated by a bit of terminology. Things which are subjects of a certain modal law can also be objects in another mode. For example, a rock is a physical subject and can be a biotic object (in the sense that it may provide a habitat, e.g.). Laws generally govern subject-subject and subject-object relationships. In addition to governing subjects, law also serves to endow them with meaning: “everything created has dependent meaning, as a result of being subjected to law by its Creator,...[and] it is in the opening-process [of the dynamic development of science] that meaning is both deepened and relativized.” (p. 25)

Stafleu sums up the aim of science as the “theoretic opening up of the full creation” (p. 29), understood as the deepening understanding of our intuitive (naïve, pre-theoretical) knowledge via both modal and typical law formulation. Physics deals with only the first four modal aspects (numerical, spatial, kinematic, and physical), finding its focus on the fourth while recognizing its being founded upon the three preceding aspects. Stafleu identifies the key distinguishing feature

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1The PCI is also known as “the Amsterdam philosophy” or “Dooyeweerdianism”.
2Modal, unlike typical, laws refer to universals (e.g. that all objects interact gravitationally is considered a modal law).
of classical vis-à-vis antique physics to be the recognition of the importance of the kinematic modal aspect as motivator instead of investigating typicality of substance. Then, with significant insight, he points out five notable advances of modern physics at its foundational level (pp. 220-2): (a) the qualifying aspect is no longer dynamic motion, but the irreducible modal aspect of physical (inter)action, (b) the recognition that the physical aspect is not reducible to the kinematic, and the relativization of the kinematic by the physical, (c) the acceptance of individuality and statistical analysis, (d) the introduction of the state concept, and (e) the distinction of modality and typicality. He concludes this by saying

By and large, we can say that the most striking aspect of 20th-century physics is the emphasis on the analysis of the structure of matter. As observed, classical physics [had] turned its back to this analysis, in favour of a purely modal explanation of natural phenomena. Of course, this does not mean that modern physics implies a return to Aristotelian physics... [T]he modal analysis, mostly due to classical physics, is a necessary prerequisite for a fruitful study of typical structures. (pp. 223-4)

Don Petcher similarly suggests that the use of string theory in attempts to solve this century’s most stubborn physics problem, the unification of general relativity and quantum field theory, fundamentally departs from old ideas of space-time which in more conventional “backdrop” formulations persist from the era of classical physics.

One rather helpful approach of Stafleu is to stress the abstractness of speaking of isolated systems. While such abstraction is beneficial, even necessary, in the formulation of modal laws, it must be remembered that physical properties are exhibited only via interaction. This he relates in connection with systems “having” properties described by operators:

[T]he potential character of the state must be discussed taking into account all three basic distinctions of our philosophical framework. Distinguishing law side and subject side, we discover that the properties of a system have the character of a law, and cannot be possessed by the system, apart from its interaction with other systems. Distinguishing modality and typical individuality, we allow for the contingency of the state concurrently with the fact that the main properties in which one is interested (position, momentum, energy) possess a modal, universal nature... Finally, the distinction of the modal aspects helps us to understand the relativization of the pre-physical modal relations in physically qualified systems. (p. 178)

Stafleu exhibits significant disagreement with prevalent interpretations of quantum mechanics (p. 223). Citing the fact that “there are many observable macroscopic effects which cannot be accounted for by any classical theory,” he disagrees with the “view that quantum physics is only relevant on a microscopic scale.” Also, since classical physics “was wrong in its attempt to explain everything in...especially modal kinematic terms,” he disputes the notion that “classical physics [is] a limiting case of quantum physics.” Finally, noting that “[o]bservation is strictly

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speaking not a physical act, but a psychical one which has a physical aspect,” he “consider[s] it a fallacy to state that quantum physics is less objective than classical physics.” For Stafleu, the measurement problem is not a problem: “The reduction of the wave packet occurs in any interaction of microsystems, not only in interactions of a microsystem with a macrosystem, e.g., in a measuring process... [T]he micro-macro system interaction characteristic of the measuring process is merely a special case of physical interaction.” (p. 122) Stafleu finds resolution of the problem by keeping “in mind that the theory only applies to isolated systems and potential interactions... Strictly speaking, isolated systems do not exist, and the concept is even objectionable, since we characterize physical systems by their interaction as the basic physical subject-subject relation.” (p. 193) Stafleu believes that the collapse of the wavefunction\(^4\) which happens in measurement and in any external interaction must ultimately be understood by a non-linear quantum theory.

While not being particularly clear in his brief mention of the Einstein-Podolsky-Rosen (EPR) thought experiment, it seems Stafleu assumes that either an interaction between the entangled particles collapses the wave function of each particle at the start, or that interactions along the way to the spacelike separated detectors do the collapsing\(^5\); he seems to be unaware of the deep mysteries of the phenomenon. It must be kept in mind, however, that Stafleu’s book was written in 1980, both before the Aspect experiment verified Bell’s theorem, and before David Mermin’s lucid presentation of the problem\(^6\). Besides, the EPR “paradox” continues to be misunderstood by or at least remain enigmatic to many physicists. However, Stafleu may well be of the opinion that a non-linear quantum theory will address this too.

Stafleu writes, “one can observe that a subject’s physical properties, to the extent by which they change, refer back to the kinematical aspect” (p. 61). Interaction between physical subjects is held to be the qualifying feature of the physical aspect. This may lead one to doubt whether a consistent distinction can be maintained between the physical and kinematic modal aspects in the PCI, since interactions at bottom involve the exchange of mediating virtual bosons, so that it seems motion is the essence of interaction. Instead, this just demonstrates that the physical aspect very significantly requires the kinematic (as indeed the biotic requires the physical, e.g.) as one expects in a non-reductionist scheme.

Stafleu’s *Time and Again* demonstrates the utility of the PCI for physics in a convincing way. Even physicists who are not Christians will find themselves often agreeing with it albeit for completely different reasons. The two main successes of Stafleu are, in my view, an insightful analysis of the development of physics from antiquity through classical to modern as a systematic opening up of creation, and the description of “having” properties as being in the law more than in the entity.

\(^4\)Stafleu does not use the words, “collapse of the wavefunction”, preferring rather to speak about “actualization”.

\(^5\)This may be related to Zurek’s notion of decoherence, as John Polkinghorne pointed out to me.