Motion as a Notion

1.1 Introduction

Law, and international law in particular, sits at the oscillation point between competing forces; stability and change, rest and motion.¹ According to Ackermann and Fenrich, ‘[l]aw ought to be steady as a rock and reliable in times of uncertainty, while simultaneously adaptable to shifting needs and emerging challenges’.² This tug of war between stability and change is revelatory of the fact that international law is a dynamic system that, on the one hand, needs to accommodate for the fundamental need for stability and predictability as the quintessential building blocks of any legal system, but, on the other hand, must also by necessity stay relevant by adapting to the ‘requirements of international life’,³ as the International Court of Justice (ICJ) put it, which do not refer only to changes in law but also to changes in fact, historic events, changing morals, and leaps in science, technology, and morals. The competing forces of motion and rest are the two main drivers of the international legal system, and not just of that. As more poetically put by Emerson, ‘[m]otion or change, and identity or rest, are the first and second secrets of nature: Motion and Rest. The whole code of her laws may be written on the thumbnail, or the signet of a ring’.⁴

¹ See M Ambrus and R Wessel, ‘Between Pragmatism and Predictability: Temporariness in International Law’ (2014) 45 NYIL 3, and all articles in that volume.
⁴ RW Emerson, ‘Nature’ in J Slater, AR Ferguson and JF Carr (eds), Collected Works of Ralph Waldo Emerson, Vol III: Essays (Belknap Press/Harvard University Press 1983) 105. More than two millennia earlier, Aristotle had said something quite similar when he proposed that nature (but nature as an attribute of objects) is an inner principle of kinesis (change/motion) and of being at rest (Aristotle, Physics II:1, 192b20–3).
1.2 The Force That Set Things in Motion

The idea for *Treaties in Motion* resulted from an observed bias in international authorship to examine treaties in a relatively static and fragmented way; for instance, through the lens either of the Vienna Convention on the Law of Treaties’ (VCLT)\(^5\) structure, or of a particular VCLT provision (eg Articles 31–33 VCLT on interpretation), or of its application in a specialised regime. Treaties are the connecting bridge between the two constant competing interests of, on the one hand, stability of international relations and, on the other hand, ensuring the adaptability/dynamism of the international legal system. The concept of time, so critical in the functioning of treaties, is implied in the classical aphorism that treaties are ‘living instruments’.\(^6\) However, this concept of treaties being living instruments has been inextricably linked to evolutive/dynamic interpretation.\(^7\) That is not eo ipso incorrect. However, to relegate the concept of time and change with respect to treaties only to the process of interpretation is a somewhat gross oversimplification. Treaties, as any rule of international law, are in a constant state of motion. As in nature no object is ever in a condition of absolute stasis (even when it is motionless), the same is true for treaties. Treaties, the ‘treaty on treaties’ (as the VCLT is sometimes referred to), and the customary law on treaties constantly evolve, change, and adapt. This process is not a compartmentalised one. It does not affect only treaties or only their interpretation. This ‘motion’ of treaties is ubiquitous. It affects treaties even before their coming into existence (*in statu nascendi*) up until and including their termination. Furthermore, the aforementioned motion affects not just treaties but also the rules on which these treaties are based (ie treaty law based either on the VCLT or customary international law). The VCLT itself also partakes of this motion in two ways. First, its content also

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\(^6\) *Vo v France* [GC] ECtHR, App No 53924/00 (8 July 2004) [82]; *Tyrer v UK* ECtHR, App No 5856/72 (25 April 1978) [31]; *Loizidou v Turkey* (Preliminary Objections) [GC] ECtHR, App No 15318/89 (23 March 1995) [71]; *RR v Poland* ECtHR, App No 27617/04 (26 May 2011) [186]; *EB v France* [GC] ECtHR, App No 43546/02 (22 January 2008) [92].

1.3 Notion of Motion

The concept of motion was central to ancient Greek philosophy. So much so, in fact, that some of the arguments proposed on whether motion is something real or merely an illusion were and continue to be debated even today. Zeno of Elea, for instance, is famous for proposing a number of paradoxes in which he attempted to prove the illusion of motion, in defence of the teachings of his mentor, Parmenides of Elea, who had famously argued that there is no motion at all. Zeno’s most famous paradoxes of motion are three: (i) the bisection paradox; (ii) Achilles’s race against a tortoise; and (iii) the (non)-moving arrow paradox.

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8 Aristotle, *Physics* VI:9, 239b10; according to this paradox, which is very similar to the Achilles’ paradox, one can never traverse a specific distance, eg walk from one end of the room to the other. The reason is quite simple, according to Zeno. In order to achieve that goal, one would have to walk half the distance of the room. Once that was accomplished, out of the remaining distance, half would have to be traversed as well. After that, the half of the remaining distance, and so on and so forth ad infinitum. Since there is an infinite number of halfway points, and since no mortal human being can perform infinite tasks in a finite amount of time, then clearly motion is impossible and what we perceive as motion is an illusion.

9 Ibid 239b15; in this paradox, Zeno asks his audience to imagine that Achilles is racing against a tortoise. Because Achilles is famous for his speed (after all Homer used the adjective ‘swift-footed’ to describe him in the *Iliad*) he offers the tortoise stadium-odds, ie the tortoise will start the race being one stadium (a stadium, or *stadion*, in ancient Greece was a unit of length, equivalent to roughly 175 meters) ahead of Achilles. As soon the signal is given, both Achilles and the tortoise start racing. However, in Zeno’s view, no matter how fast Achilles is he will never be able to overtake the tortoise. The reason is quite simple. As soon as Achilles covers the distance of one *stadion* the tortoise will have moved a distance. Achilles will then cover that distance as well within a short amount of time. But by that point the tortoise will have moved a, smaller granted but existing nonetheless, distance, and so on and so forth. Achilles will always be trailing slightly behind the tortoise.

10 According to this thought experiment by Zeno, an arrow is at rest if it occupies a place equal to itself. However, even a moving arrow at any given instance will occupy a particular place in space. Consequently, the arrow will always be at a state of rest, as it will always occupy a particular place, neither moving into that place nor out of that place. Consequently, there is no motion occurring and the arrow is always at rest.
Paying homage to these paradoxes, the authors of the present book, inspired by Marcel Duchamp’s *Nude Descending a Staircase No 2*, where a person is depicted in the various stages of descending a staircase all at the same time, selected the image that features as the cover of the present book. This not only alludes to Zeno’s paradoxes of motion but also to various attempts at their refutation, as well as to more recent theoretical views on the matter of time and change, as will be analysed next and in Sections 1.4–1.5.

Many have grappled with finding ways to resolve Zeno’s paradoxes, or proving them to be pseudo-paradoxes. Diogenes the Cynic famously attempted to refute Zeno’s paradoxes of motion in the simplest possible fashion. After listening to them, he simply stood up and walked,¹¹ which led to the phrase *solvitur ambulando* being coined. Aristotle’s own attempt at refutation is a precursor of Georg Cantor’s mathematical refutation several centuries later, and distinguishes between actual infinity and potential infinity.¹² Bertrand Russell and several other philosophers believed that Zeno’s paradoxes on motion have been solved, at least mathematically,¹³ by the transfinite arithmetic invented by Cantor.¹⁴ The motion paradoxes emerge from several unsubstantiated presumptions, such as that humans are incapable of performing ‘supertasks’, ie infinitely many acts performed in a finite interval of time,¹⁵ that all infinite series are of the same nature, or that since an infinite set consists of infinite elements its sum will tend to

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¹¹ Simplicius, *On Aristotle’s Physics* 1012.22 (Bloomsbury 1997).
¹⁴ G Cantor, *Contributions to the Founding of the Theory of Transfinite Numbers* (Ph Jourdain tr, Dover Publications 1951); J Ferreirós, ”‘What Fermented in Me for Years’: Cantor’s Discovery of Transfinite Numbers’ (1995) 22 HistMath 33.
infinite. However, as has been demonstrated by set theory, this is far from the case, since not all infinities are equal.16 Despite the continuous claims that Zeno’s paradoxes of motion have been refuted, every now and then there is another additional refutation or another venue of inquiry (mathematical, physical or philosophical) that is deemed worthy to explore. As Alfred North Whitehead insightfully remarked: ‘To be refuted in every century after you have written is the acme of triumph . . . No one ever touched Zeno without refuting him, and every century thinks it worthwhile to refute him.’ 17 This goes to show how critical the inquiry into the very nature of motion has been and remains, not only in philosophy but in other sciences as well, including the legal science.

As mentioned, Aristotle made one of the early attempts at refutation of Zeno’s claim that motion is an illusion. This should come as no surprise, as the father of science had dealt in one of his treatises with the topic of motion. It is precisely Aristotle’s typology of motion that has influenced the structure and focus of the present book and therefore it is helpful to reproduce it in full. In his Categories, Aristotle, unlike Zeno, not only accepts motion (kinesis) but typologises it in six categories and provides an analysis of the interactions and differences between these six groups. Those six categories are: generation (genesis), destruction (phthora), increase (auxesis), diminution (meiosis), alteration (alloiosis), and change of place (kata topon metabole). In more detail:

XIV – Of Motion
There are six sorts of movement: generation, destruction, increase, diminution, alteration, and change of place.

It is evident in all but one case that all these sorts of movement are distinct each from each. Generation is distinct from destruction, increase and change of place from diminution, and so on. But in the case of alteration it may be argued that the process necessarily implies one or another of the other five sorts of motion. This is not true, for we may say that all affections, or nearly all, produce in us an alteration which is distinct from all other sorts of motion, for that which is affected need not suffer either increase or diminution or any of the other sorts of motion. Thus,

16 In the present case, we are dealing with a convergent series, ie an infinite series whose sequence of its partial sums tends to a limit. By ‘limit’ what is meant is that the partial sums of that divergent series become ever closer to a given number. In the case of Zeno’s paradoxes, the infinite series is in the form of: \( s_n = 1/2 + 1/4 + 1/8 \ldots \). The closer \( n \) gets to infinite the sum of the series, \( (s_n) \) tends to 1.

17 AN Whitehead, Essays in Science and Philosophy (Philosophical Library 1948) 114.
alteration is a distinct sort of motion; for, if it were not, the thing altered would not only be altered, but would forthwith necessarily suffer increase or diminution or some one of the other sorts of motion in addition; which as a matter of fact is not the case. Similarly, that which was undergoing the process of increase or was subject to some other sort of motion would, if alteration were not a distinct form of motion, necessarily be subject to alteration also. But there are some things which undergo increase but not alteration. The square, for instance, if a gnomon is applied to it, undergoes increase but not alteration, and so it is with all other figures of this sort. Alteration and increase, therefore, are distinct.

Speaking generally, rest is the contrary of motion. But the different forms of motion have their own contraries in other forms; thus, destruction is the contrary of generation, diminution of increase, rest in a place or change of motion. As for this last, change in the reverse direction would seem to be most truly its contrary; thus, motion upwards is the contrary of motion downwards, and vice versa.

In the case of that sort of motion which yet remains, of those that have been enumerated, it is not easy to state what is its contrary. It appears to have no contrary, unless one should define the contrary here also either as 'rest in its quality' or as 'change in the direction of the contrary quality', just as we defined the contrary of change of place either as rest in a place or as change in the reverse direction. For a thing is altered when change of quality takes place; therefore, either rest in its quality or change in the direction of the contrary may be called the contrary of this qualitative form of motion. In this way, becoming white is the contrary of becoming black; there is alteration in the contrary direction, since a change of a qualitative nature takes place.18

18 Aristotle, *Categories*, ch XIV; the original text is as follows: '§ 14. Κινήσεως δὲ ἑστίν εἰδὴ ἔξ: γένεσις, φθόρα, αύξησις, μείωσις, ἀλλοιώσις, κατὰ τόπον μεταβολῆς.

Αἱ μὲν οὓς κινήσεις φανερὸν ὅτι ἐπεραῖ άλληλόν εἰσὶν — οὐ γὰρ ἑστίν ἡ γένεσις φθόρας οὐδὲ γιὰ ἡ ἀύξησις μείωσις οὐδὲ κατὰ τόπον μεταβολῆς, ὡσαύτως δὲ καὶ οἱ άλλα: ἐπὶ δὲ τῆς ἀλλοιώσεως ξέχει τινὰ ἀπορίαν, μήποτε ἀναγκαῖον ἤ τὸ ἀλλοιωμένων κατὰ τίνα τῶν λοιπῶν κινήσεων ἀλλοιώσαται.

Τότε δὲ οὐκ ἂλληθες ἑστὶν—σχεδὸν γὰρ κατὰ πάντα τὰ πάθη ἢ τὰ πλείστα ἀλλοιώσασθαι συμβεβηκεν ἡ ἐξ ὀυδεμίας τῶν ἄλλων κινήσεως καυσμοῦσθαι—οὕτε γὰρ αὔξησαι ἀναγκαῖον τοῦ κατὰ τόπον κινούμενον οὔτε μειοῦσθαι, ὡσαύτως δὲ καὶ ἐπὶ τῶν ἄλλων. ὡσθ' ἔτηρα ἄν ἐπὶ παρὰ τὰς ἄλλας κινήσεις ἢ ἀλλοιώσεις: εἰ γὰρ ἂν ἡ ἂντι δεῖ τὸ ἀλλοιωμένου ἱκόνος καὶ αὔξησαι ἢ μειοῦσθαι ἢ τινὰ τῶν ἄλλων ἀκολουθεῖν κινήσεις: ἄλλ' οὐκ ἄντριτη.

ὢσαύτως δὲ καὶ τὸ αὐξημένον ἢ τίνα ἄλλην κίνησιν κινούμενον ἀλλοιώσασθαι: ἄλλ' ἑστὶν τῶν αὐξημένων δ' οὐκ ἀλλοιωῦσθαι: οἷον τὸ τετράγωνον γνύμονα περιτεθέντος ἔχεται μὲν, ἀλλοιωμένον δὲ οὐδὲν γεγένηται: ὡσαύτως δὲ καὶ ἐπὶ τῶν ἄλλων τῶν τοιούτων.

رغب' ἔτηρεν ἄν ἐπίσημα αἱ κινήσεις ἀλλήλων.

[15b.1-32] 'Εστὶ δὲ ἄπλος μὲν κίνησις ήμείας ἐναντίον—ταῖς δὲ καθ' ἑκάστα, γενέσθαι μὲν φθόρας, αὔξησει δὲ μείωσις· τῇ δὲ κατὰ τόπον μεταβολῆ ἢ κατὰ τόπον ἠμεία μάλιστα οὐκ ἄντικευόταται, καὶ εἴ δάσα ἢ εἰς τοὺς ἐναντίον τόπον μεταβολῆ, οἷον τῇ κάτωθεν ἢ ἃνει, τῇ ἀνωθεν ἢ κάτω.
1.4 Motion as Change

The word used by Aristotle for motion is *kinesis*. This term has a wider meaning than simply 'locomotion'. It refers to that, but it also refers to change. And this is neither the only point where the connection between motion and change is made, nor where its critical role is highlighted. Nature, according to Aristotle, is an inner principle of *kinesis* (change/molotion) and of being at rest. Natures as inner principles of change/motion and rest are contrasted with active powers or potentialities (*dunameis*), which are external principles of change and being at rest, operative on the corresponding internal passive capacities or potentialities (*dunameis* again).

Even today the connection between motion and change is evident. According to the Oxford Dictionary, ‘motion’ is the ‘action or process of moving or being moved’. This is not extremely helpful as far as definitions go. If we then turn to the definition of ‘move’, then we get ‘change the place, position, or state of’, which goes to show that motion...
and change are concepts inextricably linked on multiple levels. Critical to the idea of motion is the manifestation of change either to the position or to the state of being of the object examined.

Unsurprisingly, change as a manifestation of motion was tackled extensively in ancient Greek philosophy. Zeno’s mentor, Parmenides of Elea, was famous for arguing that everything is one and nothing changes.\(^25\) Heraclitus of Ephesus, on the other hand, took the completely opposite view,\(^26\) believing that ‘everything changes/moves/flows and nothing stands still’.\(^27\) In the philosophy of Heraclitus, change is a foundational block. One of his most famous quotes is ‘δὶς ἐσ τὸν αὐτόν πνευμόν ὁὐκ ἔν ἐμβαίη’, which translates to ‘the same person cannot enter the same river twice’. Here, Heraclitus touches on the paradox of change and of identity. According to him, the moment a person enters a river at a particular instance in time, that river will consist of a certain volume of water, and that volume of certain very specific atoms of hydrogen and oxygen. If after a few minutes the same person attempts to enter the allegedly ‘same’ river, they would be entering a completely different river, or so Heraclitus posits. The droplets of water covering you during your first immersion have long moved on with the flow of the river. The second time around, you are entering a river that is both qualitatively and quantitatively different.\(^28\)

This Heraclitus’s river paradox is one of a string of similar paradoxes,\(^29\) such as Theseus’s ship paradox\(^30\) or Chrysippus’s

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25 Russell, *The History of Western Philosophy* 48–52. Parmenides’s views were expounded in his poem *On Nature*, which has survived only in *fragmenta*.

26 Although Parmenides would not accept this, because since all is One and indivisible, there can be no opposition.

27 ‘πάντα ρεῖ καὶ οὐδὲν μένει’; Plato, *Cratylus* 402a.

28 Various solutions have been offered and theories developed as a direct result of the ongoing discussion on how to reconcile this paradox with our everyday experience of time, change and identity; see in more detail Section 1.4.

29 A favourite tool of ancient Greek and Roman philosophers in order to highlight either the pitfalls of our own preconceptions or the limits of our quest for true knowledge. For instance, Agrippa held that true knowledge is unobtainable, as any logical argument would inexorably lead to one of the three following logical dead-ends: (i) an *argumentum ad absurdum*, ie an argument leading to a paradoxical/absurd conclusion; (ii) an *argumentum ad infinitum*, an argument that ends up in an eternal, self-perpetuating circular argument; or (iii) an axiomatic argument, ie an argument which is based on a statement that can be neither proven or disproven. This is known as *Agrippa’s trilemma*. For an overview of the trilemma and modern responses to it, see PD Klein, ‘Contemporary Responses to Agrippa’s Trilemma’ in J Greco (ed), *The Oxford Handbook of Skepticism* (OUP 2008) 484–503.

30 Plutarch, *Theseus* ch 23:1. According to this paradox, Theseus has devoted to the gods the ship that he used on his quest to slay the Minotaur. However, due to the passage of time, several wooden planks of the ship need to be replaced at regular intervals. This process is
A detailed analysis of these paradoxes falls outside the scope of this book, nonetheless all have as a common denominator the aforementioned notion of motion as change. In addition to this and in the context of the aforementioned philosophical musing on motion, motion as change is also strongly connected with the passage of time, which brings us to an additional manifestation of motion.

1.5 Motion through Time

So, is time a concept clearly distinct from motion and change? Absolutely not, either according to ancient Greek philosophers or to more modern scientific minds in physics. ‘Time, [Aristotle] says, is motion that admits of numeration… There always has been motion, and there always will be; for there cannot be time without motion’.33

Repeated over and over, to the extent that none of the original planks survives. The question is at which point (if any) did the ship stop being his old ship and become a new one due to the replacement of rotten planks to the extent that the entire ship ended up being comprised of entirely new pieces of wood. Thomas Hobbes posited a modern variant of this paradox. In the previous example, another ship is built in a different location, and every time Theseus’s ship needs new planks, those are taken from that second ship, and the planks from Theseus’s ship are used in that second ship. Gradually, the new ship would consist entirely of the original planks of Theseus’s ship. In that case, which of the two ships would be the true Theseus’s ship, the one in the original place, or the one in the second location? And if a change happened, at what point in time did it happen? Or alternatively, do we at any point end up with a situation where we have two Theseus’s ships existing at the same time? Th Hobbes, Elements of Philosophy – The First Section, Concerning Body (R and W Leybourn 1656) ch XI, sect 7, 100. See also H Deutsch, ‘Relative Identity’ (Stanford Encyclopedia of Philosophy, 17 August 2018) accessed 20 September 2019.

31 Philo, De aeternitate mundi IX:48–51. Chrysippus, a third-century BC Stoic philosopher, posited the following paradox, which is similar to Hobbes’s variant of Theseus’s ship. We have two men: Dion and Theon. The only difference between these two men is that Theon consists of Dion minus his left foot. Chrysippus asks the following question: If a situation occurs where Dion’s left foot is amputated, then does this affect the relationship between Theon and Dion? Do they remain two distinct entities that simply occupy the same space, or do we only have one entity? If the latter is the case, which entity has survived? Has Dion ceased to exist and been subsumed by Theon, or has the reverse taken place, i.e. Theon being subsumed by the now-amputee Dion? For an in-depth analysis of this paradox, see MB Burke, ‘Dion and Theon: An Essentialist Solution to an Ancient Puzzle’ (1994) 91 JPhil 129–39; WR Carter, ‘Dion’s Left Foot (and the Price of Burkean Economy)’ (1997) 57 Philos&PhenomenolRes 371–9.

32 Although for why this is the case, he does not offer an explanation.

Physics as well have demonstrated that time is but another dimension through which we can move, and Einstein’s special and general relativity highlighted the interconnection between motion in the 3-D space and time. It is this very modern understanding of time as another dimension, additional to the three dimensions of space, and through which objects move that led the authors of this book to reconceptualise one of the six types of motion that Aristotle had identified, specifically altering the change of place type of motion \((\textit{kata topon metabole})\) to change of place and time \((\textit{kata topon kai chronon metavole})\). This type of motion permeates the entirety of \textit{Treaties in Motion}.

The conceptualisation of time as a dimension spilled over from the realm of physics into that of philosophy as well. The link between time, change, and motion has led to the emergence of a number of philosophical schools that offer theories trying to explicate these phenomena. The two most prominent schools of thought on the matter are endurantism (endurance theory) and perdurantism (perdurance theory). The critical difference between these two schools is the answers they provide as to how things persist, how they change through time, and whether objects have only spatial or also temporal parts. Since time and temporal parts is a \textit{differentia specifica} between endurantism and perdurantism, the former school of thought is often referred to as three-dimensionalism (3D-ism), whereas the latter as four-dimensionalism (4D-ism).

[34] Albeit, and as long as the speed of light holds as the maximum speed that can be achieved in our universe, only in one direction. This is known as ‘time’s arrow’ a phrase coined by A Eddington, \textit{The Nature of the Physical World} (CUP 1928) 68–9. Eddington and Neumann were of the view that time has an intrinsic arrow that points in the direction of entropy change, ie heat dissipation; \textit{contra} C Callender, \textit{What Makes Time Special?} (OUP 2017) 21, who argues that the arrow of time is not a feature of time itself, but only of the ‘local asymmetries in material processes’. The reason why Callender focuses on asymmetry is because asymmetry is the feature that gives time its alleged directionality. See also P Horwich, \textit{Asymmetries in Time} (MIT Press 1987) 38, who claims that ‘the current empirical evidence indicates that time itself is intrinsically symmetric’.


[36] See in this chapter, Section 1.7.


[38] Because, as we shall see, in perdurantism time considerations and the temporal nature of objects are predominant.