

Temporality of Law

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ABSTRACT

Temporality is an integral part of law. But the legal commentary offers no analytical model to explore the fusion of law and temporality. This article proposes such a model and presents the four general principles of law's temporality. First, the principle of temporal correlation provides legally significant inferences. Although temporality per se is not the agent of change, events that occur within a short duration of time are presumed to be causally related. Second, the principle of temporal inertia carries the dynamics of normative change and stability. It illustrates the doctrine of precedent and prohibitive injunctions as manifestations of temporal inertia. Third, the principle of temporal triggers elucidates how law uses the point in time (t) and duration (Δt) to both allocate and terminate powers, rights, and obligations. These time triggers, though arbitrary, contribute convenience and efficiency to the management of legal affairs. Finally, the principle of temporal cooperation delineates time-sharing, which enhances productivity and the utilization of assets. A workplace fortified with sovereign spatiotemporal borders may increase employee coordination and output, but cooperative flextime enmeshes work with socially gratifying lives. The framework of four principles invites lawyers, scholars, and judges to further explore the union between law and temporality.

I. INTRODUCTION

Temporality is an integral part of law. When one searches for connections between law and time, one finds that “temporality suffuses popular [and professional] understandings of law.”¹ Concepts such as mortgages and installment sales contracts draw on temporality in order to structure transactions, to schedule payments, and to calculate the assemblage of equity in real and personal properties.² Temporal deadlines, incorporated in statutes of limitations, obstruct late prosecution of civil claims and criminal charges.³ Temporal proximity of events reveals whether crimes are committed in the heat of passion or whether self-defense is lawfully exercised.⁴ Prison sentences are expressed in temporal units, ranging from days to years. The date of birth provides a defining

1. Carol J. Greenhouse, *Just in Time: Temporality and Cultural Legitimation of Law*, 98 YALE L.J. 1631, 1631 (1989).

2. See *Graves v. Diehl*, 958 S.W.2d 468, 470-71 (Tex. Ct. App. 1997) (stating that a conditional sale transfers possession of the property to the purchaser but the title remains in the seller until the purchase price is paid in full).

3. See, e.g., William N. Eskridge, Jr. & Philip P. Frickey, *Foreword: Law as Equilibrium*, 108 HARV. L. REV. 26, 63-64 (1994) (pointing out the misapplication of the limitation period).

4. V. F. Nourse, *Self-Defense and Subjectivity*, 68 U. CHI. L. REV. 1235, 1243-44 (2001) (noting that time carries meaning in criminal law, particularly in the law of murder and self-defense).

temporal reference to allocate civil rights and obligations, including the right to vote and the potential obligation to serve in the armed forces.⁵

The United States Constitution contains numerous references to temporality. The preamble secures the blessings of liberty to posterity, proposing the continuation of the Constitution for an indefinite period.⁶ The Constitution fixes the qualifying ages for Representatives, Senators, and the President, thus furnishing a temporal test for elected officials.⁷ It also provides that “[n]o Senator or Representative shall, during the Time for which he was elected, be appointed to any civil Office under the Authority of the United States”⁸ No state or Congress shall pass an ex post facto law.⁹ No State shall engage in war unless the danger of invasion is imminent and will not allow delay.¹⁰ The Constitution also promotes the “Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the Exclusive Right to their respective Writings and Discoveries.”¹¹ The President holds office during a term of four years.¹² The President’s compensation cannot be increased or decreased during the term for which he is elected.¹³

Despite the plentiful and obvious connections between law and time, the legal academy has undertaken few systematic studies of law’s temporality.¹⁴ The academic literature examines issues of time as they arise in specific areas of law, but no principles of temporality have been extracted from the annals of law to be studied separately.¹⁵ This study uncovers the general principles of temporality that permeate the entire enterprise of law. Accordingly, the research for this study is not confined to a single topic. The research traverses diverse subject matters

5. Real ID Act of 2005, 49 U.S.C. § 30301 (Supp. 2008) (requiring proof of date of birth for motor vehicle and driver programs).

6. See U.S. CONST. pmb.

7. “No Person shall be a Representative who shall not have attained to the Age of twenty five Years” *Id.* art. I, § 2, cl. 2. Senators must be at least thirty when elected. *Id.* § 3, cl. 3. The President must be thirty-five years old. *Id.* art. II, § 1, cl. 5.

8. *Id.* art. I, § 6, cl. 2.

9. *Id.* art. I, § 9, cl. 3.

10. *Id.* art. I, § 10, cl. 3.

11. *Id.* art. I, § 8, cl. 8.

12. *Id.* art. II, § 1, cl. 1.

13. *Id.* art. II, § 1, cl. 7. This is not an exhaustive list of temporal references in the Constitution. Other constitutional provisions are as follows: “[The President] shall from time to time give Congress Information of the State of the Union.” *Id.* art. II, § 3. “All Debts contracted and Engagements entered into, before the adoption of the Constitution” are valid. *Id.* art. IV, cl. 1. “No law, varying the compensation for the services of the Senators and Representatives, shall take effect, until an election of Representatives shall have intervened.” *Id.* amend. XXVII. The terms of Senators and Representatives end “at noon on the 3d day of January” *Id.* amend. XX, § 1.

14. See generally, e.g., Rebecca R. French, *Time in the Law*, 72 U. COLO. L. REV. 663 (2001). Professor French furnishes numerous insights into the temporality of law but stops short of constructing any analytical framework for understanding the connections between law and temporality.

15. Even general research on time is scattered. See Deborah G. Ancona et al., *Taking Time to Integrate Temporal Research*, 26 ACAD. MGMT. REV. 512 (2001) (noting that the proliferation of research on time has led to incoherence and a lack of integration among researchers).

ranging from temporary injunctions to time-sharing arrangements for vacation properties. This wide-ranging sweep bypasses doctrinal details irrelevant to the study of temporality. An overarching examination of law's temporality rather than scrutiny in any one area of law is the primary focus of this study.

Imparting fresh insights, the study introduces a special vocabulary to analyze law's temporality. This analytical vocabulary consists of phrases and symbols. Some phrases, such as "temporal proximity" and "time series analyses," already exist in legal vocabulary. Other phrases, such as "temporal inertia" and "temporal triggers," are introduced to explain important legal concepts. Legal professionals are most familiar with legal analysis through doctrinal phrases. Discussion through symbols is not yet common. This study demonstrates, however, that temporal symbols provide clarity and economy of analysis that mere phrases cannot render. Each temporal symbol is explained and associated with a corresponding phrase. Phrases and symbols are often interchangeable while the analytical model offered to explore law's temporality builds on the precision of temporal symbols.

Analytically, temporality is broken down into point in time (t) and duration (Δt), the two most important elements of time. All other symbols used in this study are logical variations of these two primary elements of temporality. The (t) refers to a point in time (say April 15) whereas the (Δt) refers to a span of time (say six months). These two elements of temporality, (t) and (Δt), are explained in diverse legal settings, and each element plays a distinct role in legal actions. The point in time (t) triggers various statutory rights and obligations; likewise, the timeframe (Δt) is a constitutive element of law in numerous transactions. A more deliberate understanding of point in time (t) and duration (Δt) sharpens our understanding of how temporality intersects with law. Analysis of diverse legal topics—such as the doctrine of precedent, temporal proximity, statutes of limitation, depreciation, and priority competition in secured transactions—in terms of point in time (t) and duration (Δt), reveals the simplicity of law's temporality.

Substantively, this Article offers four general principles of temporality that perform a variety of legal functions. Part I explains the primary elements of point in time (t) and duration (Δt), while laying the foundation for the four principles discussed in the remainder of the Article. Part II examines the principle of temporal correlation that law uses to determine cause and effect in order to draw legally significant inferences. Part III offers the principle of temporal inertia that the law employs to both affect and to resist social change. Part IV presents the principle of temporal triggers that allocate and terminate powers, rights, and obligations. Finally, Part V discusses the principle of temporal cooperation that markets and law use to promote efficiency and productivity and to safeguard family and social time.

In discussing these four principles, this Article invites readers to reflect upon other relationships that might exist between law and temporality. Given the enormity of the subject matter, this Article is by no means definitive on law's

temporality, but initiates a conversation for the benefit of scholars, lawmakers, and judges who can further refine these principles.

II. BASICS OF TEMPORALITY

The measurement of time is a human construct.¹⁶ It is an undertaking in relativity. Even though time is an elusive concept that provokes both poetic imagination and scientific quest, the measurement of temporality has been a shared concoction of customs, astronomy, and mathematics. Egyptian agriculture, for example, drew great benefit from the Nile floodwater. Since the Nile floods at the same time every year regardless of the weather, computing a calendar was necessary to take advantage of the floodwater.¹⁷ Centuries ago, the Sumerians divided the day into hours, minutes, and seconds. Perhaps fascinated with numbers six and sixty, the Sumerian astronomers and mathematicians created the sexagesimal computation of time and divided the day into twenty-four hours,¹⁸ the hour into sixty minutes, and the minute into sixty seconds.¹⁹ The modern world has divided the second into a millisecond.²⁰

A. Units of Temporality

The nine units of time—millisecond, second, minute, hour, day, week, month, year, and century—may be divided into two broad categories: micro and macro units.²¹ Each unit measures a duration of time that, as explained later, will be called *delta tee* (Δt). Micro units measure small durations of time; macro units—large. Millisecond, second, minute, hour, day, and week can be classified as micro units, thus leaving month, year, and century as macro units.

16. See generally D.S. Landes, *The Wilkins Lecture, 1988: Hand and Mind in Time Measurement: The Contributions of Art and Science*, 43 NOTES & REC. ROYAL SOC'Y LONDON 57 (1989) (analyzing the history of tools that measure time).

17. Michael Rycraft, *What is the Date Then?*, 78 MATH. GAZETTE 298 (1994) (explaining the Egyptian calendar).

18. STEPHEN BERTMAN, *HANDBOOK TO LIFE IN ANCIENT MESOPOTAMIA* 334 (2005).

19. F. Thureau-Dangin, *Sketch of a History of the Sexagesimal System*, 7 OSIRIS 95 (1939). Despite the early availability of sexagesimal system to measure time, most communities across the world did not embrace Mesopotamian micro temporality at the functional level. The division of day and night into morning, noon, afternoon, evening, night, and midnight, rendered short-term conceptions of time. The daily activities of individuals, families, and communities were scheduled with reference to these segmental divisions of day and night.

20. A standard camera shutter speed is 8 milliseconds and the duration of light for a typical photo flash strobe is 1 millisecond. See Photo Tidbits, *How Does Your Focal Plane Shutter Work?*, Feb. 13, 2007, <http://www.wrotniak.net/photo/tech/fp-shutter.html> (on file with the *McGeorge Law Review*).

21. On the macro side, this list may be expanded to include decade and millennium as time units. On the micro side, there is no limit in measuring micro-temporality. For a general discussion of micro-measurement, see Joseph Agassi, *Precision in Theory and Measurement*, 35 PHIL. SCI. 287, 288 (1968), reaffirming that the world is deterministic in the large but in-deterministic in the small.

This classification is defensible because there is universal consensus on the definition of the micro units listed above, but no such consensus exists with respect to the definition of the three macro units. Throughout the world, the temporal definitions of day, hour, minute, and second have been adopted.²² The newer unit of millisecond is also undisputed. Even the definition of a week as a rotational duration of seven days is now universally accepted,²³ even though there is still disagreement as to when it actually begins—while in most European nations the week begins on Monday, it begins on Sunday in the United States.²⁴ Increasingly, the week has become a significant structural unit of time as it sets the rhythm of numerous activities.²⁵

The macro units of time—month, year, and century—are also universally accepted and furnish the basic ingredients of every calendar. Yet the definition of each macro unit varies from calendar to calendar.²⁶ The Gregorian calendar consists of twelve months, but the duration of the months varies from twenty-eight days to thirty-one days.²⁷ The Iranian calendar, considered astronomically accurate, divides the first six months of the year into thirty-one days each, the next five months into thirty days each, and the final month into twenty-nine days (thirty days in a leap year).²⁸ The Islamic calendar is lunar, whereby the year is approximately eleven days shorter than the solar year and no month consists of thirty-one days.²⁹ The Jewish and the Chinese calendars are lunisolar calendars

22. Ancient Romans measured the daylight in twelve hours, but the hour varied from forty-five minutes to seventy-five minutes, depending on the season and length of the day. Berthold L. Ullman, *Daylight Saving in Ancient Rome*, 13 CLASSICAL J. 450, 450 (1918).

23. It is unclear whether all ancient civilizations constructed a seven-day week. The Hindus, Egyptians, Jews, Persians, Chinese, and Europeans all constructed the week as a division of time but the length of the week is uncertain. See THE ENCYCLOPEDIA AMERICANA, week, a7, 157 (1921).

24. The Bible seems to suggest that Sunday might be the first day of the week, though it does not specifically say so. See *Acts* 20:7.1; *Corinthians* 16:2. At Notre Dame University, however, the standard work week begins at 12:01 a.m. Saturday and runs through 12:00 midnight on Friday. University of Notre Dame, Office of Human Resources, http://hr.nd.edu/questions/faq_ben/faq_ben_taw_wrk_bgn.shtml (last visited July 15, 2008) (on file with the *McGeorge Law Review*).

25. For example, religious observances, social and recreational events, and TV shows recur every seven days. TODD D. RAKOFF, A TIME FOR EVERY PURPOSE 155 (2002).

26. In contrast to the Georgian calendar, the Egyptian year consisted of 360 days. See MNSU.edu, The Egyptian Calendar System, <http://www.mnsu.edu/emuseum/prehistory/egypt/dailylife/calendar.html> (last visited Oct. 23, 2007) (on file with the *McGeorge Law Review*).

27. For the history and evolution of the Roman calendar, see Arthur E. Kennelly, *Proposed Reforms of the Gregorian Calendar*, 75 PROC. OF THE AM. PHIL. SOC'Y 71 (1935). Some of the known calendars are Aztec, Maya, Hindu, Zoroastrian, Persian, Hebrew, Islamic, Ethiopian, Julian, and Gregorian. A great many historical events have been recorded in accordance with the Julian and Gregorian calendars, however, both of which are astronomically inaccurate. See *id.* at 76-78.

28. The Persian and the Gregorian calendars are identical to the extent that each calendar has 365 days and the leap year has 366 days. The Gregorian calendar was derived from the Roman calendar, which was modified by Julius Caesar (46 B.C.), Augustus Caesar (8 B.C.), and Pope Gregory XIII (1582). See *id.* at 72.

29. Lunar months consist of twenty-nine or thirty days; the lunar year is approximately eleven days shorter than the solar year. *Id.* at 72-73. The Islamic century is accordingly of a different duration than one counted in terms of solar years. The lunar movements are more obvious to the naked eye since the moon undergoes a gradual but visible reduction and increase in size. Historically, the movement of the moon has been

that add an extra month every two or three years.³⁰ In 1953, India proposed that the United Nations adopt “an invariable calendar, perpetually the same, more regular, scientific and advantageous from every point of view than the present Gregorian Calendar.”³¹ No world calendar has yet been accepted.

As manifested in various calendars, temporality is both linear and cyclical.³² The micro and macro units measure time on a linear scale. The linear time is conceived in terms of past, present, and future. It also uses numbers to express temporal durations, such as life-spans and terms of political offices. The cyclical time incorporates seasons and other events that recur periodically.³³ Academic years, general elections, schedules for trains and planes, harvesting, and other activities are conceived, planned, and performed on a cyclical basis.

Furthermore, temporality is zonal.³⁴ The planet has been divided into twenty-five integer time zones measured relative to Greenwich, England (GMT).³⁵ Even within the same time zone, the seasonal resetting of clocks reminds people that temporality is a human construct that can be manipulated. In the United States, as in some other countries, people reset watches twice a year.³⁶ There was much confusion and opposition to the idea of changing the time in order to make better use of daylight.³⁷ Farmers’ schedules, on the other hand, rely upon the sunrise, and therefore receive little benefit from changing the time on watches.

Varying conceptions of macro units, different time zones, and seasonal resetting of clocks, can muddle trans-temporal transactions. Lawyers who structure trans-temporal contracts, delivery dates, and payment schedules pay extra attention to temporal relativity and its effect on parties’ mutual expectations. Despite this temporal relativity, legal systems are adapting to a

critical to develop a sense of the month. *See id.*

30. The lunisolar calendar has twelve lunar months. However, an intercalary lunar month is added once every two or three years to synchronize with the solar year. *Id.* at 73.

31. World Calendar Reform, E/2514 (Oct. 30, 1953). The discussion on this topic, however, was adjourned *sine die*. *See also* H.A. Thurston, 2991. *Reforming the Calendar*, 46 MATH. GAZETTE 43 (1962) (proposing to eliminate “useless” months and construct the year around weeks).

32. It is asserted that the Western conception of time is linear whereas the Hindu and Chinese conceptions of time are cyclical. *See, e.g.,* Peter Young, *The Sociology of Time: Histories and Historians in the Cultures of the West and of China*, 9 LEONARDO 205 (1976).

33. The movement of the earth around the sun produces seasons that rotate and repeat themselves. The solar calendar is tied to seasons, the lunar calendar is not.

34. In the United States and its territories, there are nine time zones. *See* The Official U.S. Time, <http://www.time.gov/> (last visited Sept. 10, 2008) (on file with the *McGeorge Law Review*); *see also* George Grafton Wilson, *Time and International Law*, 34 AM. J. INT’L L. 496 (1940) (noting that the time zones in the United States were established in 1918).

35. *See* GreenwichMeantime.com, Time Zones, <http://www.greenwichmeantime.com/info/timezone.htm> (last visited Sept. 10, 2008) (on file with the *McGeorge Law Review*).

36. In some countries, however, resetting of clocks is fiercely opposed. *See* Siamak Movahedi, *Cultural Preconceptions of Time: Can We Use Operational Time to Meddle in God’s Time?*, 27 COMP. STUD. SOC. & HIST. 385 (1985) (chronicling the Iranian opposition to the Shah’s proposal to reset clocks twice a year).

37. *See generally* Bob Aldrich, *Saving Time, Saving Energy: Daylight Saving Time: Its History and Why We Use It*, CAL. ENERGY COMMISSION, <http://www.energy.ca.gov/daylightsaving.html> (last visited Oct. 23, 2008) (on file with the *McGeorge Law Review*).

system of micro temporality where any neglect of hours, minutes, and even seconds can create dramatic results in legal actions and transactions.

Just as machines function with the accuracy of micro temporality, law's temporality, too, becomes micro-precise. Electronic filing of documents, which is increasingly more common, will force the legal system to contend with micro temporality.³⁸ For the most part the pace of development coincides with a sensitivity towards the units of time. Temporality has one meaning in agrarian communities that respond to the seasons,³⁹ and has another meaning in technologically-oriented societies. As the world absorbs the precision of technology, the micro units of time—hours, minutes, seconds, and milliseconds—will become more pertinent. Observance of micro temporality is necessary to promote efficiency, precision, and coordination.⁴⁰ Increasingly, the business day is keyed to the micro temporality of minutes and seconds, and sports competitions to the micro temporality of milliseconds.⁴¹ Some contracts are terminated over one minute's delay in performance.⁴²

B. *Elements of Temporality*

To analyze temporality, one must distinguish point in time (*t*) from duration of time (Δt).⁴³ In ordinary language, the word *time* is used to express both points

38. A Wisconsin case accentuates the legal significance of micro temporality. *Hyperphrase Technologies LLC v. Microsoft Inc.*, No. 02-C-647-C, 2003 WL 21920041 (W.D. Wis. 2003). *Hyperphrase and Microsoft*, the parties to a case, had until midnight on June 25, 2003 to electronically file summary judgment motions. *Id.* at *1. Microsoft did not file its motion until 00:04:27 a.m. on June 26, 2003, with some electronic documents filed as late as 1:11:15 a.m. *Id.* *Hyperphrase* summoned nine attorneys to argue that Microsoft's summary judgment motion was untimely. *Id.* In a sarcastically written order, the court noted "Microsoft's four minute and twenty-seven second dereliction of duty" and declared it to be a "frontal assault on the precept of punctuality." *Id.* However, the court forgave Microsoft's "tardiness" and promised *Hyperphrase* "the evenhandedness of [the court's] magnanimity . . . on some future occasion." *Id.* In future cases, however, micro temporality may no longer be derided. Professor Alex Glashauser brought this case to my attention.

39. In pastoral and agricultural communities, where the modes of living and the means of production are related to seasons, the law sees little need to define temporality in terms of hours and minutes. Time is quantified in days and months and the day is measured in mornings, afternoons, evenings, and nights. See, e.g., David Turton et al., *Agreeing to Disagree: The Measurement of Duration in a Southwestern Ethiopian Community*, 19 CURRENT ANTHROP. 585 (1978) (noting that the pastoral tribes living in this part of the world define duration in terms of natural events, such as rainfall or flooding of the river).

40. In 1901, a commentator complained that "unpunctuality of passenger service is in England a wrong without a remedy." W. M. Acworth, *The Rights of Railway Passengers in Respect of Unpunctuality*, 3 J. SOC'Y COMP. LEGIS. 31, 31 (1901).

41. Everybody benefits when trains and planes arrive on time and when scheduled events begin and end at the prescribed hour.

42. Even tardiness of a few minutes is being litigated. See *Union Eagle Ltd. v. Golden Achievement Ltd.*, [1997] 1HKC 173. (discussing whether a ten minute delay in tendering payment for a conveyance terminates the contract). For a comment on this case, see Judith Sihombing, *Union Eagle: Then and Now*, 30 H.K. L.J. 501 (2000).

43. For a nineteenth-century rendition of the concept, see THEODULE RIBOT, *THE EVOLUTION OF GENERAL IDEAS* 159-94 (1899).

in time and durations or timeframes.⁴⁴ Words such as *now*, *before*, and *after* refer to points in time. By contrast, words such as *always*, *awhile*, and *a short time* express durations of time. Contrast *Defendant entered the house in the evening* with *Defendant remained in the house all night*. *Defendant entered the house in the evening* is a point in time (t) statement. The *evening* is the point in time (t) when Defendant entered the house even though the exact time of entry (t) is not fixed in terms of precise micro units (hours and minutes). *Defendant remained in the house all night* is a durational (Δt) statement. *All night* is the duration (Δt) in which Defendant remained in the house. Both points in time (t) and durations (Δt) are distinct elements of time that may be precisely clocked.⁴⁵

Suppose that a court hearing begins at 10 O'clock (t_1) and ends at 11 O'clock (t_2). The one hour during which the court hearing lasts is the duration (Δt).⁴⁶ The following equation expresses the definition of duration between two distinct points of time (t_1) and (t_2):

$$(\Delta t_{2-1}) = (t_2) - (t_1)$$

Points in time ($t_1, t_2 \dots t_n$) and durations ($\Delta t_{2-1}, \Delta t_{3-2} \dots$) are the basic elements of temporality. Throughout this study, the symbol (t_1) refers to the beginning of an event or transaction, whereas the symbol (t_2) refers to the ending of that same event or transaction. The general symbol (t) refers to a point in time.

A point in time (t) may be precisely broken down into milliseconds. A point in time (t) may also be expressed as a full day. The date of birth is the beginning of life (t_1). The law measures the duration of life from the date of birth, taking (t_1) as the day rather than the precise time in hours and minutes when the person is born. For legal purposes, therefore, (t_1) and (t_2) are often expressed in days rather than in hours, minutes, or seconds.⁴⁷ Thus, any unit of time may be taken as a point in time (t), even though one minute has a duration (Δt) of sixty seconds and one day has a duration (Δt) of twenty-four hours.⁴⁸ This conceptual difficulty of

44. Please note that this study uses "duration" and "timeframe" interchangeably.

45. The duration or timeframe (Δt) must not be confused with units that measure timeframe (Δt), just as the measurement of an object cannot be confused with the object itself. Micro and macro units of time are necessary to measure timeframe (Δt). But the conception of timeframe (Δt) exists without hours, minutes, and seconds, as it did before the invention or active use of these units.

46. The Greek (Δ) means "the change in . . ." BENJAMIN CROWELL, NEWTONIAN PHYSICS 77 (2003).

47. BRAD T. BORDEN, TAX-FREE SWAPS 89 (2007). The Internal Revenue Code requires that the exchange property must be identified within the identification period (Δt). *Id.* at 89. The first day of the period is the day the property is relinquished (t_1). *Id.* The identification period ends at midnight on the forty-fifth day following the transfer. *Id.* The exchange must be completed within 180 days (Δt). *Id.* In his book, Brad Borden draws a timeline to explain the identification and exchange periods. *Id.*

48. The distinction between point in time (t) and duration (Δt) may be a subject of judicial controversy. See *United States v. Rodriguez-Moreno*, 526 U.S. 275, 278, 281 (1999) (concluding that the use of a gun during a crime of violence cannot be confined to the jurisdiction where the gun was first used (t_1) but the offense may be tried in any jurisdiction in which kidnapping continues, because kidnapping is a unity offense that lasts for the duration (Δt) until the person is freed (t_2)).

separating point in time (t) from duration (Δt), however, does not undermine practical use of the distinction between the two temporal elements.

The timeframe (Δt) may vary from milliseconds to months and years. The honeybee flaps its wings every five milliseconds. An earthquake may last for a few seconds. A 100-meter dash is precisely clocked in seconds and milliseconds. Snow may fall for several hours. A crime may be committed in a matter of seconds, providing little opportunity for eyewitnesses to make reliable identifications.⁴⁹ A notice for an appeal must be filed in thirty days. A prison sentence may last for several months. Land leases may be granted for ninety-nine years.⁵⁰

Moreover, the point in time (t) and duration (Δt) are crucial aspects of legal transactions. The date of delivery (t) is a key element in contracts.⁵¹ The date of birth (t_b) determines the age of majority. A lease transfers the right of possession and the use of goods or real property for a mutually agreed duration (Δt). The financing statement filed to perfect a security interest is effective for a period of five years after the date of filing—a timeframe (Δt) fixed by law.⁵² The mortgage obtained on real property may span over a number of years (Δt). A loan payment is in default if the deadline (t_d) for payment is breached.

The concept of a business day redefines the conventional understanding of the day. A business day is much shorter than twenty-four hours; furthermore, not every day of the week is a business day. If a nation treats Saturday and Sunday as non-business days, time-sensitive services may delay transactions.⁵³ If a bank requires three business days for an out of town check to post, and the check is deposited on Friday, the check will take five days to clear. The accounting may become even more complex if the banking day is defined as part of the business day ending at, say, 2 p.m.⁵⁴ If the check is deposited at 3 p.m. on Friday (t_1), the first business day will be Monday and not Friday, thus extending the duration (Δt) for the transaction to six days. Time-sensitive international transactions become more intricate because time zones vary and nations designate different days of the week as non-business days.

49. *Wilson v. Mazzuca*, No. CV-01-2246, 2007 WL 952037, at *19 n.45 (E.D.N.Y. 2007).

50. *See, e.g., Fluent v. Salamanca Indian Lease Auth.*, 928 F.2d 542 (2d Cir. 1991) (describing the controversy over leases that the Seneca Nation of Indians refused to renew for another ninety-nine years in the City of Salamanca).

51. Avery Wiener Katz, *The Economics of Form and Substance in Contract Interpretation*, 104 COLUM. L. REV. 496, 527-28 (2004) (noting that a late delivery may constitute a breach of contract). The Chinese prefer a penalty clause to stimulate punctual delivery. Stephanie J. Mitchell & Daniel D. Stein, *United States-China Commercial Contracts*, 20 INT'L L. 897, 909 (1986).

52. U.C.C. § 9-515(a) (2000).

53. *See* Robert G. Ballen et al., *Commercial Paper, Bank Deposits and Collections, and Other Payment Systems*, 43 BUS. LAW. 1305, 1317 (1988).

54. *Id.*

C. Definite and Indefinite Durations

1. Definite Durations

Laws are enacted either for definite or indefinite durations (*def.Δt* & *ind.Δt*). Most laws prescribe no date for their expiration; they continue to exist and function for an indefinite duration (*ind.Δt*) until specifically repealed. Some laws exist but are no longer used. Laws not used for a long duration may lose their validity, a circumstance known as desuetude.⁵⁵ Under common law, abandoned laws may not later be invoked to determine legal relations or effects.⁵⁶ However, desuetude is not universally accepted as a basis to declare laws invalid.⁵⁷ Divine laws, even if they are not used for long durations, are timeless (∞) in that they cannot be modified, repealed, or declared invalid through desuetude.⁵⁸

Laws made to last only for a definite duration (*def.Δt*) are said to contain sunset provisions. A sunset provision predetermines all or part of the life of a statute.⁵⁹ Such a provision, unless renewed, ceases to exist at the specified date (t_d). Thomas Jefferson, a great advocate of the sunset concept, argued that sunset laws are in harmony with nature and the changing forces of evolution. Jefferson wrote, “[N]o society can make a perpetual constitution, or even a perpetual law. The earth belongs always to the living generation.”⁶⁰ Although Jefferson’s proposal did not become a principle of common law jurisprudence, its conceptual clarity inspired many proponents who argue for a temporal demystification of positive laws and legislative accountability.⁶¹

A timeframe (Δt) measurement requires that the time of initiation (t_1) first be determined. Thus, a definite duration (*def.Δt*) must have an ascertainable point of origin (t_1) as well as an ascertainable point of termination (t_2). The United States Constitution has predetermined that the Presidential term will begin at noon on January 20th (t_1) and end at noon on January 20th four years later (t_2).⁶² In schools and colleges, the schedule is set in advance to announce the start time (t_1) and duration (Δt) for each course offering.

If only one point in time (t) of a specific duration is determinable but not the other, the duration is indefinite (*ind.Δt*). An obligation for an indefinite duration may have begun at (t_1), but its termination point (t_2) will remain unknown until

55. Kim Forde-Mazrui, *Ruling Out the Rule of Law*, 60 VAND. L. REV. 1497, 1543-44 (2007).

56. *Id.*

57. See Note, *Desuetude*, 119 HARV. L. REV. 2209, 2209-12 (2006).

58. Liaquat Ali Khan, *The Immutability of Divine Texts*, 2008 BYU L. REV. 807.

59. Rebecca M. Kysar, *The Sun Also Rises: The Political Economy of Sunset Provisions in the Tax Code*, 40 GA. L. REV. 335 (2006).

60. Letter from Thomas Jefferson to James Madison (Sept. 6, 1789), in 6 THE WORKS OF THOMAS JEFFERSON 3, 8-9 (Paul Leicester Ford ed., 1904).

61. In the 1960s, Lowi renewed the Jeffersonian concept of sunset laws to fight interest groups that dominate the making of laws. See generally THEODORE J. LOWI, THE END OF LIBERALISM (1969).

62. U.S. CONST. amend. XX.

the obligation is actually terminated. Rarely is an obligation valid in perpetuity (∞). A contract for an indefinite period, for example, does not last in perpetuity but is valid for a reasonable duration.⁶³ Common law disfavors perpetual durations.⁶⁴ The Rule Against Perpetuities proscribes propertied persons from controlling future alienation of property.⁶⁵ In Scotland, where no such prohibition exists, few perpetual trusts are created.⁶⁶ In the United States, however, new opposition has successfully unseated the Rule Against Perpetuities in numerous jurisdictions.⁶⁷ Accordingly, trusts may be established for an indefinite duration (*ind. Δt*).⁶⁸

In some areas of law, an indefinite duration (*ind. Δt*) poses no legal problems.⁶⁹ As noted earlier, the timeframe (Δt) is an essential part of a lease. Often, oil and gas leases are granted for a primary timeframe (Δt) that usually extends up to ten years; thereafter, the lease turns into one of indefinite duration (*ind. Δt*). This indefinite or open-ended duration (*ind. Δt*) is valid “so long as oil or gas is produced in paying quantities.”⁷⁰ If the lessee fails to produce oil and gas during the open-ended duration (*ind. Δt*), the lease may terminate. The purpose of the open-ended duration (*ind. Δt*) is to explore, develop, and produce oil and gas from the leased premises.⁷¹ The lessee cannot hold the leased land for an unreasonable timeframe (Δt) for speculative purposes.⁷²

Unlike the open-ended timeframe leases for oil and gas (*ind. Δt*), commercial property leases are rarely conditioned upon the development of the leased property. If the lessee develops the property, thereby appreciating its value for sale or for rent, she does not acquire any preferential rights to continue to lease the property.⁷³ Most commercial leases contain an option to renew after the expiration of the primary duration (Δt). The renewal option typically requires that the lessee provide written notice at some designated deadline (e.g., six months)

63. See, e.g., *Anglo Fabrics Co., Inc. v. Town of Webster*, No. 942629A, 2002 WL 31187829, at *1 (Mass. Super. Ct. 2002). Vague promises of employment “until retirement” or “so long as you live” cannot establish a contract. See *Geib v. Alan Wood Steel Co.*, 419 F. Supp. 1205, 1208 (E.D. Pa. 1976); *Aboczky v. Stier*, 18 A.2d 262, 263 (N.J. 1941) (stating that a provision of indefinite duration should be interpreted to require performance for a reasonable period of time); *Lightcap v. Keaggy*, 194 A. 347 (Pa. Super. Ct. 1937).

64. Max M. Schanzenbach & Robert H. Sitkoff, *Perpetuities or Taxes? Explaining the Rise of the Perpetual Trust*, 27 *CARDOZO L. REV.* 2465, 2479, 2495-96 (2006); Robert H. Sitkoff & Max M. Schanzenbach, *Jurisdictional Competition For Trust Funds: An Empirical Analysis of Perpetuities and Taxes*, 115 *YALE L.J.* 356, 375 n.62, 393-94 (2005).

65. See generally Jesse Dukeminier, *A Modern Guide to Perpetuities*, 74 *CAL. L. REV.* 1867 (1986).

66. *JESSE DUKEMINIER & JAMES E. KRIER, PROPERTY* 338 (5th ed. 2002).

67. Schanzenbach & Sitkoff, *supra* note 64, at 2465-66.

68. *Id.*

69. *Ocean Grove Camp Meeting Ass'n v. Reeves*, 75 A. 782, 784 (N.J. Sup. Ct. 1910), *aff'd*, 79 A. 1119 (N.J. 1911) (noting that an indefinite lease may create ownership equivalent to a fee simple).

70. *Lease of Oil and Gas Lands*, 30 U.S.C. § 226 (2005).

71. The lease is akin to a defeasible property interest that is a grant of a fee simple subject to a condition subsequent.

72. *Gregg v. Harper-Turner Oil Co.*, 199 F.2d 1, 3 (10th Cir. 1952).

73. *S. Ry. Co. v. Peple*, 228 F. 853 (8th Cir. 1915).

before expiration of the lease (t_e). If the lessee delays giving notice and breaches the contractual deadline (t_d), the lease does not renew. Courts have been overly formalistic in enforcing the deadline (t_d) notice, disregarding the amount of money that the lessee has used to develop the leased property.⁷⁴ Even implied notices of renewal have been rejected as enforceable substitutes for the required temporal notice.

2. Indefinite Durations

In some cases, both the origination (t_1) and the termination (t_2) of duration (Δt) may not be determinable with certainty and yet the point in time (t) may fall within an otherwise ascertainable timeframe (Δt). For example, the information regarding the burglar's entry time (t_1) and exit time (t_2) into a dwelling may not be known with certainty. Yet the fact that the burglary took place at some point in time (t) during the night (Δt) is critical information because the point in time (t) is a constitutive element of the common law offense of burglary.⁷⁵

Sometimes, laws introduce deliberate temporal ambiguity. For example, common law recognizes that the accused has the right to a speedy trial.⁷⁶ "Speedy" (Δt) in this context requires that a trial take place without delay.⁷⁷ To measure the delay, courts fix the day of the arrest or of the indictment, whichever is earlier, as the origination point in time (t_1) from which they then measure duration (Δt).⁷⁸ Despite fixing an origination point (t_1), the determination of a speedy duration (Δt) has been anything but easy. No fixed numerical timespan of years or weeks can be used to measure whether the right to a speedy trial has been violated. Courts consider multiple factors when assessing whether the actual duration (Δt) between origination (t_1) and trial day (t_2) violates the right to a speedy trial.⁷⁹ Likewise, the concept of "reasonable time" used in numerous legal doctrines is an imprecise duration (Δt) that cannot be fixed as number of days.⁸⁰

74. C.R. Anthony Co. v. Wal-Mart Properties, Inc. 54 F.3d 514 (1995) (discussing improvement and termination of leases).

75. The common law burglary was a nocturnal housebreaking. WILLIAM BLACKSTONE, COMMENTARIES ON THE LAWS OF ENGLAND; Apprendi v. New Jersey, 530 U.S. 466, 514 (2000) (citing Jones v. State, 63 Ga. 141, 143, 1879 WL 2442, at *1 (1879)).

76. The right to a speedy trial has been traced back to The Magna Carta in 1215. See Alan L. Schneider, *The Right to a Speedy Trial*, 20 STAN. L. REV. 476, 483 (1968); see also U.S. CONST. amend. VI.

77. George C. Thomas III, *When Constitutional Worlds Collide: Resurrecting the Framers' Bill of Rights and Criminal Procedure*, 100 MICH. L. REV. 145, 225-26, 228 (2001) (noting that even six months can violate the right to speedy trial).

78. United States v. Marion, 404 U.S. 307, 319-21 (1971) (noting that the right to speedy trial attaches upon defendant's arrest or indictment, whichever comes first).

79. Mary M. Schroeder, *Appellate Justice Today: Fairness or Formulas, The Fairchild Lecture*, 1994 WIS. L. REV. 9, 16 (1994).

80. Michel Paradis, *Just Reasonable: Can Linguistic Analysis Help Us Know What It Is To Be Reasonable?*, 47 JURIMETRICS J. 169, 175 (2007) ("[C]ases mentioning 'reasonable time' in New York State numbered into the thousands.").

Despite their inherent imprecision, ambiguous temporal concepts such as “speedy trial” and “reasonable time” furnish useful legal standards.

Sometimes, an indefinite duration (*ind.Δt*) is adopted as a deliberate policy. Life-tenure, for example, is a part of many laws. Although a life-tenure must expire, it is an indefinite duration (*ind.Δt*) because the expiration of life-tenure cannot be fixed with certainty. While life-tenure is a useful concept of property law, it may or may not be useful in other legal contexts. A political office for life, for example, may spawn corruption and dictatorship. Life-tenure for judges, on the other hand, is considered indispensable for judicial independence.⁸¹ It frees judges to decide cases without the worry of losing their jobs. Life-tenure severs the umbilical cord that ties judges to the nominating political process.⁸² No longer tied to the political process for job security, judges can decide cases in good conscience according to the law.⁸³

There is, however, an increasing academic opposition derived from temporality to judicial life-tenure. The arguments against life-tenure invoke the classical correlation between linear temporality and deterioration. Some argue that life-tenure weakens the democratic process and good decision-making.⁸⁴ Because of an increase in the average life span, judges spend far more time on the bench. As a result, fewer replacement slots open, resulting in intense confirmation battles.⁸⁵ Long appointments to the bench also promote judicial activism and unaccountability. Although these ideological arguments fail to convince those who dread the rise of populist courts,⁸⁶ the argument of temporal deterioration seems appealing. The deterioration argument insists that old judges, in the last years of their life-tenures, are physically and mentally frail and cannot fully discharge their judicial duties.⁸⁷

Acts of God, or *force majeure*, can introduce uncertainty into temporality. The duration (Δt) of natural events is often unpredictable.⁸⁸ However, after the

81. Federal judges in the United States are selected through a partisan political process. The President nominates federal judges, including Supreme Court Justices, and the Senate confirms nominations. Presidential nominations are frequently ideological as are Senate confirmations. Partisan debates in the Senate expose the ideological dimension of the federal judiciary, particularly the United States Supreme Court whose rulings constitute the supreme law of the land.

82. See generally Darrell McGowen, *Life-tenure—An Indispensable Ingredient to an Independent Judiciary*, 75 ILL. B.J. 620 (1987).

83. See generally David R. Stras & Ryan W. Scott, *Retaining Life-tenure: The Case for a “Golden Parachute”*, 83 WASH. U. L.Q. 1397 (2005) (arguing for the retention of life-tenure of Supreme Court Justices).

84. Saikrishna B. Prakash, Book Review, *America’s Aristocracy*, 109 YALE L.J. 541, 568 (1999).

85. Steven G. Calabresi & James Lindgren, *Term Limits for the Supreme Court: Life-tenure Reconsidered*, 29 HARV. J.L. & PUB. POL’Y 769, 771 (2006).

86. Ward Farnsworth, *The Ideological Stakes of Eliminating Life-tenure*, 29 HARV. J.L. & PUB. POL’Y 879 (2006).

87. See generally David J. Garrow, *Mental Decrepitude on the U.S. Supreme Court: The Historical Case for a 28th Amendment*, 67 U. CHI. L. REV. 995 (2000).

88. The concept of Δt is a discovery, and not an invention, because God’s Universe is suffused with the concept of duration. The Acts of God are durational. The occurrence of a natural event may not be confused with Δt during which the event will continue to occur. Occurrence and duration are not synonymous. The

completion of a natural event, its duration (Δt) may be precisely calculated. In human reproduction, for example, pregnancy is a durational (Δt) event that begins with conception (t_1) and completes with the delivery of the child (t_2). The average duration of pregnancy ($p.\Delta t$) is 280 days. Yet premature babies are born, upsetting regular duration (Δt) calculations. Acts of God can also disrupt scheduled events and transactions. Although the origination point (t_1) and duration (Δt) for future events can be precisely set in advance, no guarantee exists that the events will take place as scheduled. *Force majeure* may not only affect the departure (t_1) or the arrival of a ship (t_2), but may also increase the duration of its journey (Δt).⁸⁹

III. TEMPORAL CORRELATION

This section examines the principle of temporal correlation. In common parlance, temporality is so strongly associated with change that many mistakenly believe that the passage of time (Δt) causes change. The principle of temporal correlation, however, expounds that temporality is correlated with change, but temporality does not itself cause change; nor does it resist change. Law nonetheless uses the correlation between temporality and change to determine legally significant relations.

A. *Temporality and Change*

Consider motion. A person can engage in motion without any conception of time. Motion, however, is often defined in terms of time. Suppose Witness starts from point A and reaches point B in forty minutes (Δt). Suppose further that Witness needs another twenty-three minutes (Δt) to reach point C, the scene of the crime. This serial motion from point A to B to C is expressed in duration of time (Δt). It is also understood in terms of past, present, and future. Witness was at point A in the past, i.e., forty minutes ago; Witness is at point B in the present, i.e., now; and Witness will be at point C in the future, i.e., twenty-three minutes from now. The fractionalization of time in micro units measures the motion in a more precise manner. The tensing of time in past, present, and future distinguishes completed activity (A to B) from uncompleted activity (B to C).

The serial motion, however, occurs regardless of the fractionalization or tensing of time.⁹⁰ In fact, temporal measurement is irrelevant to the occurrence of

weather experts may forecast the occurrence of snowfall on a certain time of the day. This prediction is about occurrence and not Δt . How long the snow falls is duration. The duration may be incessant with no breaks or it may be intermittent with breaks. One may say that the snowfall lasted for two days, even though there were intervals within the prescribed period when no snow was falling. Even with highly sophisticated knowledge, the precise Δt of natural events may not be determinable in advance.

89. A flight that normally takes ninety minutes to go from point A to point B may take 110 minutes due to poor visibility or other weather conditions.

90. URSULA COOPE, *TIME FOR ARISTOTLE* (2005) (arguing that time is not related to change).

motion. No duration (Δt) causes motion from point A to B or B to C; the duration (Δt) simply measures motion in time. Likewise, the concept of tensed time—past, present, and future—furnishes useful information regarding completed and uncompleted motion, but tense is not critical to the performance of motion.⁹¹ Neither measurement nor tense causes motion. The act of motion occurs independent from the time measurement of distance. Witness may travel from point A to B without ever knowing the distance in feet or minutes or in any other standard of measurement. This lack of knowledge does not prevent Witness's journey from point A to B to C.

Most frequently, the passage of time (Δt) is correlated with changes in natural phenomena and events of life. These durational changes (Δt) may be positive, negative, or both. The durational changes (Δt) may encompass growth and advancement, or they may contain depreciation and destruction. Durational changes (Δt) may also delineate both development and deterioration. The timeframe (Δt) of human life, for example, can be expressed as a bell-curve. The child grows with the passage of time acquiring physical strength, height, and maturity, as well as understanding of the world. With time, the adult gradually reaches his or her full potential. Although the timeframe (Δt) associated with the rising side of the bell-curve signifies development and rising intelligence, even a healthy individual must experience the falling side of the bell-curve. The timeframe (Δt) associated with the waning process gradually dismantles physical strength and mental alertness. Health fails, disease overtakes the body, and the individual dies. Finally, the timeframe (Δt) of life ends.

Again, it is important to remember that timeframe or duration (Δt) does not cause physical change. Gaining or losing physical strength depends on complex genetic and environmental factors. Aging is real, but age is a temporal construct to measure the duration of life from birth (t_1) to death (t_2). It would be accurate to categorize persons in their twenties as more robust than persons in their eighties. The correlation between age and physical integrity, however, does not mean that temporality causes or undermines physical integrity.

Yet, an empirically valid correlation between age (Δt) and physical health furnishes useful information about mortality risk. The actuarial assumptions about how long a person will live are critical in pricing life insurance premiums. Life insurance actuaries do not rely on clinical information to predict how long a person will live. Instead, they use statistics and formulas to interpret data and to predict life expectancy. Many annuities currently available are not based on mortality risk, yet they are tied to the concept of duration (Δt). If the purchaser of an annuity dies before the contractual duration (Δt) expires, the insurance company pays the balance to the purchaser's estate.⁹²

91. THE NEW THEORY OF TIME 2-6 (L. Nathan Oaklander & Quentin Smith eds., 1994).

92. NationsBank of N.C., N.A. v. Variable Annuity Life Ins. Co., 513 U.S. 251, 262-63 (1995).

The span of time (Δt) may also correlate to negative and positive changes in the value of assets. The negative change is depreciation in the value of assets whereas positive change is appreciation in the value of assets. Law correlates these changes with duration (Δt). The concept of depreciation recognizes that a value-generating asset loses its own value in the process.⁹³ An equipment producing widgets has a limited duration (Δt), and the market value of the equipment will depreciate each year until it becomes zero. Thus, the depreciation is measured in duration (Δt).⁹⁴ Contrariwise, the appreciation is also measured in duration (Δt). Risk-free investments, such as certificates of deposit or treasury bonds, guarantee a net increase in the value of money deposited over a period of time (Δt).⁹⁵ Even risk-prone investments are marketed to increase in value over a period of time (Δt)—a view expressed by the catchphrase, “buy and hold.”⁹⁶

The duration (Δt) provides a guiding correlation to the exigencies of perishable assets. An asset is perishable if it loses its complete market value within a short duration (Δt). For example, flowers and eggs are perishable assets. Farmers must sell their farm products at the time of harvest.⁹⁷ Farmers can suffer big losses if buyers who market farm products to retail markets depress prices, knowing that farmers have little choice but to sell what would otherwise perish. “It is folly to suggest to the farmer with a carload of cattle on the market to ‘take them home’ or to ‘haul back his load of wheat’ or other commodity.”⁹⁸ In view of the temporal vulnerability of farm products, antitrust laws exempt farmers so that they can cooperate and coordinate their sales to get higher prices. Even in bankruptcy cases, perishable assets, such as grain, must be sold to save the estate from unnecessary losses.⁹⁹

B. Temporal Proximity

This section demonstrates that temporal proximity of events that occur in a short timeframe ($s.\Delta t$) serves as a useful and convenient surrogate to determine causation. Temporal proximity does not assert that time causes change. The

93. Danny P. Hollingsworth & Walter T. Harrison, *Taxation of Intangibles*, 9 J.L. & COM. 51, 64 (1989) (showing that “wasting away of the asset” is the “focal point of depreciation”).

94. To justify depreciation, for example, the tax law requires that (1) the asset have a limited life and (2) the limited life be reasonably ascertainable. *Id.* at 74.

95. Melvin Aron Eisenberg, *Probability and Chance in Contract Law*, 45 UCLA L. REV. 1005, 1063 (1998).

96. Stephen M. Bainbridge, *Director Primacy and Shareholder Disempowerment*, 119 HARV. L. REV. 1735, 1745 (2006) (short-term speculation and long-term investments in a corporation are conflicting wealth-maximization strategies).

97. “With flowers having such a limited life span, growers cannot await a better market by warehousing nor may growers regulate production in the short term. Growers must sell what their plants produce when the plants produce.” *Floral Trade Council v. United States*, 74 F.3d 1200, 1203 (Fed. Cir. 1996).

98. *Nat’l Broiler Mktg. Ass’n v. United States*, 436 U.S. 816, 840 (1978) (White, J., dissenting) (quoting 59 Cong. Rec. 7856 (1920)).

99. *See Matter of C & S Grain Co.*, 47 F.3d 233 (7th Cir. 1995).

actual causation may not be knowable. In fact, when actual causation is unknowable, temporal proximity may be used to deduce causation. The causation derived from temporal proximity is, therefore, speculative. However, law relies on temporal proximity to interweave events, draw inferences, and attach liability.

In legal matters, temporal proximity is said to exist if events occur in a short timeframe ($s.\Delta t$). If event A precedes event B, but both events occur in a short timeframe ($s.\Delta t$), the two events are presumed to be causally related. More specifically, event A is presumed to have caused event B. Temporal proximity is thus essentially the occurrence of events in a narrow timeframe ($s.\Delta t$) that may vary from seconds to weeks. In most cases, the timeframe (Δt) within which events A and B occur must be short in order to assert meaningful causation. In other cases, law can presume causation although event B occurs weeks after event A.

When the two events occur within a short timeframe ($s.\Delta t$), one event causing the other is only a probability and not a certainty. The courts recognize that “the mere fact that two events correspond in time [Δt] does not mean that the two necessarily are related in any causative fashion.”¹⁰⁰ Rather, “a temporal relationship between exposure to a substance and the onset of a disease or a worsening of symptoms can provide compelling evidence of causation.”¹⁰¹ But awaiting external symptoms may no longer be necessary. Sophisticated and reliable technologies may, in a short timeframe ($s.\Delta t$) (or even immediately), connect toxic exposure to cellular injuries that show no external symptoms. A tighter timeframe ($s.\Delta t$) in which the exposure and latent injury occur, may provide a more reliable correlation to allocate tortious liability. Thus, technological bio-studies of cellular changes occurring shortly after the exposure may clarify an understanding of physiological causation and can reinforce the legal doctrine of temporal proximity.¹⁰²

In evidence law, temporal proximity allows for the admission of excited utterances as an exception to the hearsay rule. If an event excites a person to utter certain words, the words are taken to be concurrent with a natural and reliable reaction to the event. The event and the excited words have to occur together in a short timeframe ($s.\Delta t$). Although the speaker is not available to testify, the words may be admitted as evidence through a surrogate witness who was present at the scene and heard the excited utterance.

In employment discrimination cases, temporal proximity provides significant clues to the employer’s discrimination or retaliation. If the employer fires an employee within a week after learning that the employee is pregnant, “[t]emporal proximity between a protected activity and an adverse employment action may

100. *Westberry v. Gislaved Gummi AB*, 178 F.3d 257, 265 (4th Cir. 1999).

101. *Id.*

102. Jaime A. Grodsky, *Genomics and Toxic Torts: Dismantling the Risk-Injury Divide*, 59 STAN. L. REV. 1671, 1710 (2007) (noting that technology may change the concept of latent harm).

support an inference of discrimination.”¹⁰³ When an employee is fired soon after exercising First Amendment rights, temporal proximity may be used to establish causation.¹⁰⁴ “Proof that exercise of protected expression was a substantial and motivating factor can be shown by close proximity in time between the exercised First Amendment rights and retaliatory action.”¹⁰⁵

In homicide cases, the passage of time (Δt) between provocation and slaying may be a critical factor in determining murder charges. Murder is a pre-meditated act, which means that the perpetrator makes up his mind to kill before he acts upon the decision to kill. The timeframe (Δt) between forming the intent and carrying out the act may span from minutes to years. The longer the period of deliberation, the more likely it will support the element of pre-meditation. However, when a person is provoked to kill, the duration (Δt) between provocation and killing can be short. In California, jury instructions emphasize the duration in order to separate murder from manslaughter. The killing is reduced from murder to manslaughter if the killing has “occurred while the slayer was acting under the direct and *immediate* influence of such quarrel or heat of passion.”¹⁰⁶ In contrast, if the accused is no longer affected by a sudden quarrel or heat of passion, “and sufficient time [Δt] has elapsed for angry passion to end and for reason to control his conduct, . . . [the jury] will no longer reduce an intentional killing to manslaughter.”¹⁰⁷

When one country uses force against another, temporal proximity has also been a constitutive element of the right to self-defense.¹⁰⁸ The threatened state may use force if an attack is imminent. With the attack still a future event (t_2), the right to self-defense is exercised before the attack occurs (t_1). The exercise of self-defense after the attack has occurred also demonstrates temporal proximity. In each case, the attack time (t) and the self-defense time (t) fall within a short duration ($s.\Delta t$). Temporal proximity is another way of saying that proximate events occur within a short duration of time ($s.\Delta t$) of each other.

The anticipatory self-defense reverses the traditional notion of temporal proximity. It allows for the exercise of self-defense before an attack even becomes imminent. Although the attack time and the self-defense time may still fall within a short duration and occur in the same order as they do under the imminence analysis, the possibility of self-defense before the possible aggression even becomes imminent creates an ominous equation. How soon before an actual

103. *Canavan v. Rita Ann Distrib.*, No. CCB-03-3466, 2005 WL 670777, at *5 (D. Md. 2005).

104. *Schwartzman v. Valenzuela*, 846 F.2d 1209, 1211-12 (9th Cir. 1988). *But see Anderson v. Coors Brewing Co.*, 181 F.3d 1171, 1179 (10th Cir. 1999) (concluding that temporal proximity alone may not be sufficient to show discrimination).

105. PRATT & SCHWARTZ, SECTION 1983 CIVIL RIGHTS LITIGATION 642-43 (1996).

106. CALIFORNIA JURY INSTRUCTIONS: CRIMINAL No. 8.43 (6th ed. 1996 & Supp. 2002) (emphasis added).

107. *Id.*

108. Allen S. Weiner, *The Use of Force and Contemporary Security Threats: Old Medicine for New Ills?*, 59 STAN. L. REV. 415, 448-50 (2006) (noting that the traditional view contemplates temporal proximity).

attack time may a state exercise the right of self-defense? Some scholars, for example, argue that temporal proximity may be replaced with the mere *probability* of an attack. If a state must “wait until the threat were truly imminent in the temporal sense[,] . . . there is a substantial danger of missing a limited window of opportunity to prevent widespread harm to civilians.”¹⁰⁹ On the other hand, if self-defense time precedes attack time and the duration between the two events is long, the right of self-defense may become indistinguishable from unlawful aggression.

Temporal proximity is an effective legal tool to determine cause and effect. It plays a critical role in assessing the legitimacy of self-defense. Events removed from each other in serial time are presumed to have fewer inner connections. While temporal proximity is essential to the realm of law, its use must be collaborated with other evidence.

C. *Time Series Analyses*

Time series analysis is based on the assumption that data values taken over sequential points in time ($t_1, t_2, t_3 \dots t_n$) may have an internal structure such as autocorrelation, pattern, or seasonal characteristics. Time series analysis is used in numerous studies including sales forecasts, stock market analysis, inventory studies, and workload projections. Often, time series analysis relies on data taken at equally spaced time intervals (Δt). Unlike a study of samples taken randomly for observation, time series analysis studies the data collected over a period of time in sequential order of linear time. Temporality is an essential dimension in the collection of data for time series analysis. Once the data have been gathered, the analysis focuses on finding patterns and seasonality. Small quantities of data that do not fit within the pattern might be discarded as noise. The pattern may predict data values at a future point in time (t_{n+1}).

In studying legal phenomena, the temporal series model may not strictly follow the models used in studying data in financial, labor, or stock markets. For example, time series analysis of legal phenomena may study data located within a specified timeframe (Δt) but not necessarily at equally spaced intervals. Time series analysis, however, implies that the data flows through serial time and is periodically captured. If the data does not flow through serial time, temporality would perhaps be irrelevant to the analysis. Fine-tuned to the needs of the project, time series analyses may elucidate in multiple ways.

First, time series analyses can help when drafting fact-sensitive legislation. Suppose that time series analyses show that easy availability of unsecured consumer credit relates to higher consumer bankruptcy filings. Relying on this finding, rational lawmakers can focus on regulating unsecured consumer credit rather than on enacting tougher laws to deter bankruptcy filings. Without

109. John Yoo, *International Law and the War in Iraq*, 97 AM. J. INT'L L. 563, 574 (2003).

knowing or ignoring this finding, lawmakers may rely on deterrence to enact strict bankruptcy laws. Tough bankruptcy laws may generate a false expectation of safety among lenders, who furnish more unsecured consumer credit based on the belief that tough laws deter consumers from filing bankruptcy.¹¹⁰

Second, time series analyses may be used to study court decisions. Such studies could reveal doctrinal trends, analytical methodologies, preferred citation materials, and numerous other factors that influence decision-making. Temporal series studies have shown, for example, that *The Federalist Papers* is the most frequently cited historical source that judges use for originalist interpretation of the Constitution.¹¹¹ It has also been shown that almost all United States Supreme Court Justices rely on *The Federalist Papers*, in majority opinions as well as in dissents, to support opposing interpretive and ideological positions.¹¹² The Justices have used *The Federalist Papers* in landmark decisions to offer “dueling versions” of federalism and separation of powers.¹¹³

Third, time series analyses may be employed to study the effects of legislation on social norms.¹¹⁴ Criminal statutes based on deterrence rationale may be tested in the market to verify whether deterrence shapes social behavior. For example, state statutes that toughened penalties for drunk driving can be subjected to time series analysis to compare the number of cases reported before and after the enactment of the stricter statutes.¹¹⁵ If annual numbers of drunk-driving cases continue to drop after the enactment of statutes within participating states, the finding may be used to enact similar statutes in non-participating states.

The law, however, must be careful in relying on conclusions of time series analyses; some questionable and counter-intuitive conclusions have been drawn. One study, for example, claims that a more convenient and freer access to pornography reduces incidences of rape.¹¹⁶ Also using time series analysis, Isaac Ehrlich presents a controversial thesis that the death penalty reduces murders.¹¹⁷ Todd Landman warns against the impairment of fundamental civil liberties

110. See Robert M. Lawless, *The Paradox of Consumer Credit*, 2007 U. ILL. L. REV. 347 (2007) (using time series analysis to show the availability of consumer credit on bankruptcy filing rates).

111. Pamela C. Corley, Robert M. Howard, & David C. Nixon, *The Supreme Court and Opinion Content: The Use of The Federalist Papers*, 58 POL. RES. Q. 329, 330 (2005).

112. Matthew J. Festa, *Dueling Federalists: Supreme Court Decisions with Multiple Opinions Citing the Federalist, 1986-2007*, 31 SEATTLE U. L. REV. 75, 76 (2007).

113. *Id.* at 105.

114. See Deana A. Pollard, *Sex Torts*, 91 MINN. L. REV. 769 (2007) (relying on time series analyses in drunk driving to argue that sexual transmission of disease can be minimized by creating strict liability to deter irresponsible sexual behavior).

115. Dale E. Berger & William D. Marelich, *Legal and Social Control of Alcohol-Impaired Driving in California: 1983-1994*, 58 J. STUD. ON ALCOHOL 518, 518 (1997) (focusing on drunk driving in California).

116. Anthony D'Amato, *Porn Up, Rape Down*, June 23, 2006, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=913013 (on file with the *McGeorge Law Review*).

117. Isaac Ehrlich, *Deterrence: Evidence and Inference*, 85 YALE L. J. 209 (1975) (answering the critics who dispute the deterrence thesis of capital punishment).

occurring from conclusions drawn through time series analysis, which show that liberal democracies suffer disproportionate terrorist attacks and therefore need more protective security laws.¹¹⁸

D. *Interior Temporality*

John Milton captured the mind's malleability in his famous words: "The mind is its own place, and in itself, can make heaven of Hell, and a hell of Heaven."¹¹⁹ Milton's poetic observation applies to the mind's temporality with no less accuracy. The interior temporality of the mind is both tensed and tense-free. The mind understands tensed temporality and that is why it can situate things and events in serial time.¹²⁰ The mind also understands tense-free temporality and is capable of understanding natural and human events with no temporal dimension. Most importantly, the mind has the ability to reshuffle tensed temporality, thereby distorting stored memory. This section explores the mind's interior temporality and resulting legal consequences.

First, interior temporality builds memory. The tensed temporality—divided in terms of past, present, and future—is useful in understanding the sequence of events. Tensed temporality relies on serial time in which events (*e*) can be placed in a temporal order (i.e., *e.t₁*, *e.t₂*, *e.t₃*), which means that (*e.t₁*) precedes (*e.t₂*) and (*e.t₂*) precedes (*e.t₃*) in serial time. For example, the statement, "the defendant had entered the victim's house before the victim arrived" furnishes useful information because the tensed information *the defendant had entered (e.t₁) before the victim arrived (e.t₂)* places the two events in a temporal sequence. An accurate understanding of tensed temporality is indispensable in building a reliable sequential memory.¹²¹

The facts of a case are, to a large extent, placed in tensed and serial time. Some events occur before others. While this placement of facts is in serial time as they occurred, this placement is critical to understand the veracity of a story. Civil and criminal trials build upon the serial placement and sequential logic of facts.

118. Todd Landman, *Imminence and Proportionality: The U.S. and U.K. Responses to Global Terrorism*, 38 CAL. W. INT'L L.J. 75, 85 (2007).

119. JOHN MILTON, *PARADISE LOST* 91 (A.W. Verity ed., Cambridge Univ. Press) (1667).

120. For example, experts engage in geological studies to discover and determine how the Earth's resources, including materials, structures, and processes have changed from remote past to present. These temporal studies might even predict how the Earth's resources would change in the near or distant future. In addition to understanding the temporality of the natural world, the mind also comprehends and organizes the human world in serial time. For example, human history is constructed in serial time.

121. Ancient cultures, just like modern cultures, organized time around chronographical reference points. The reference point serves to situate events in an orderly manner. The Greeks organized time around the Olympics games. Muslims chose the hijra, the forced migration of the Prophet and his few followers from Makka to Medina, as the chronological milestone to record past and future events.

In addition to building accurate memory, the interior temporality can effectively organize future events in serial time. Scheduling court hearings, holding conferences with clients, speaking with witnesses, and obtaining the prosecutor's file are minor and major events planned in serial future. If the mind could not comprehend a serial future, clients and lawyers would fail to coordinate pretrial preparations, court hearings, litigation, settlements, and other essential future activities.

In addition to understanding tensed temporality, the mind is fully capable of embracing a tense-free conception of time that makes no clear distinctions between past, present, and future.¹²² Not everything we see, hear, know, or experience is expressed in tensed time. For instance, the statement, "the sun rises in the east" is tense-free information. It is accurate, though odd and unconventional, to say that the sun rose in the east yesterday. An event that occurs on a regular basis or one that continues to occur is tense-free. If the fact that "the defendant is mentally ill" is tense-free information, it has serious implications in a criminal case. For now, the defendant cannot be found guilty and may have to be released or civilly committed to an institution.¹²³

Most important, the mind has the ability to alter the temporality of stored facts. The mind's ability to understand both tensed and tense-free information allows it to freely switch the temporality of memorized facts. This ability to switch temporality provides useful clues to understand whether witnesses report facts in a truthful or in a distorted manner. Ordinarily, the mind's interior temporality is an integral part of consciousness. Temporality is embedded in memorized facts. The facts stored in memory are ordered with sophisticated temporality, yet the mind has the ability to misreport the temporal order of facts stored in memory.

A witness who tells a distorted story is aware of the facts stored in memory and their location in serial temporality. The witness may distort facts by deliberately misreporting their temporality. The witness may misreport to the jury that the defendant struck the victim first, thus switching the temporality of stored memory when in fact the victim struck the defendant first. Distortion frequently occurs in present articulation of the past. By contrast, a failed memory is one where the temporality of stored facts has been corrupted and has become erroneous. The witness with a failed memory also misreports the temporality of facts but this misrepresentation is not a knowing distortion.

Furthermore, the interior temporality has the dual capacity to retrieve the past as well as to imagine the future.¹²⁴ The mind can recollect, as well as anticipate.

122. See MICHAEL LOCKWOOD, *THE LABYRINTH OF TIME: INTRODUCING THE UNIVERSE* 10, 53, 64 (2005).

123. Jamie Mickleson, *Unspeakable Justice*, 48 WM. & MARY L. REV. 2075, 2089-92 (2007).

124. While human skills to organize serial future are superb and highly successful communities develop respect for serial future, the human mind also possesses the ability to experience and intellectualize organic time without any sequential ordering of reality. Dreams, for example, manifest organic time as events from different

Recollection is the mind's capacity to bring past events into the present. Anticipation is the mind's ability to bring future events into the present. The details of a future event, which have yet to occur, may be as vivid as those of a past event.¹²⁵ The most remarkable feature of interior temporality is neither memory, nor imagination; it is the ability to retrieve the past and the future into the present. A past that cannot be recalled in the present and a future that cannot be comprehended in the present are sealed stores. The memory of a witness has little testimonial value unless the memory is retrieved in the present. The terms of a future contract will have little utility unless their impact can be communicated and understood in the present.

The mind understands and can therefore manipulate the logic of temporality. Suppose a statement is *either* false or true. One is likely to conclude that the statement cannot be *both* false and true. However, when we interject timeframe (Δt) into logic, the statement can be false at one point in time (t_1) and true at a subsequent point in time (t_2) or vice versa. The statement that "American laws prohibit slavery" is both a true and false statement within a timeframe (Δt). In 2008, "American laws prohibit slavery" is a true statement; however, in 1808, "American laws prohibit slavery" would have been a false statement. Thus within a timeframe (Δt) of 200 years, the same statement is both true and false. The timeframe (Δt) logic is often expressed in tensed time. The tensed time allows for contradictory statements in a timeframe (Δt). One can now say at the same point in time (t), American laws allowed (past tense) slavery and American laws prohibit (present tense) slavery. The tensed time allows the language to be accurate in expressing what would otherwise be contradictory and mutually exclusive statements.

The mind experiences shifting zones of what can be called scalenic temporality.¹²⁶ Scalenic temporality is triangular; it consists of present, past, and future. It is a temporal zone in which (past) memories, (current) experiences, and (future) anxieties and dreams freely interact with each other in complex ways to form scalenic consciousness. In the absence of interior barriers, scalenic consciousness may vary from moment to moment and from episode to episode. A mind fully engaged with a current episode might allow only small intrusions

time zones are freely blended to plot new stories that cannot otherwise exist in the sequential material world. A dead relative appears in the dream holding a newborn child born long after the relative's death. The dreamer is creating a story by placing in close proximity persons of two generations separated in serial time. In the external world, the dead relative cannot hold the newborn child. In the mind's internal world, however, sequential time poses no barrier in creating events the ingredients of which are taken from numerous zones of time. The blending of sequential times does not occur in dreams only. The human mind, even in its most wakeful state, has infinite capacity to create mental images and stories that cannot occur in the external world.

125. LANEI M. RODEMEYER, *INTERSUBJECTIVE TEMPORALITY: IT'S ABOUT TIME* 12 (2006).

126. This idea is derived from the scalene triangle in which all sides have a different length and the internal angles are all different. As compared to the right angled-triangle and the equilateral triangle, a scalene triangle is the most flexible and retains its identity even if the three sides may undergo extreme changes of reduction or increase in respective lengths. Numerous muscles in the human body, including the neck muscles, are fashioned after scalene triangles, which allow substantial movement without pain.

from the past and future. Concentration on a present task may require the mind to focus more on the current side of the scalenic triangle. A past memory can flood into scalenic consciousness, disrupting concentration and overpowering the mind. Concentration can also be disturbed when the mind drifts into dreams of the future. Scalenic consciousness is rarely completely free of intrusions from the past or future. In idle moments, when the individual is performing a task that requires no concentration, scalenic consciousness can reduce the current side of the triangle and the mind can luxuriantly dwell either in memories of bygone days or in anxieties (hopes and fears) of days to come.

Scalenic consciousness is a normal state of mind. It is not linear, nor does it follow the logic of serial time. Very few persons live in only one time dimension of the scalenic triangle. Performing tasks that require undivided focus, such as writing a legal brief, lawyers exhume past knowledge stored in their minds, whether statutory skills or vocabulary needed to translate arguments into words. While writing a brief, lawyers likewise engage with the future as they anticipate how the senior partner, the court, or a client will react to the brief. An efficient scalenic consciousness harnesses interior knowledge along with exterior research while uniting the past, present, and future awareness. Numerous legal activities, including teaching law classes or presenting oral arguments in courts of law, require a fully functional scalenic consciousness. Lawyers lose efficacy as advocates and as transactional functionaries when they do not focus on the present moment, are unable to tap efficiently into past memories, or cannot successfully speculate about the future.

Mental disorders¹²⁷ disrupt normal scalenic consciousness. Although law has moved away from the subjective implementation of “the reasonable person” standard, the mind cannot completely be expelled from the realm of law.¹²⁸ The mind can suffer from legally recognized disabilities that require accommodation at work.¹²⁹ However, law refuses to accommodate serious disorders in the scalenic consciousness. A neurologist who fails to chart patient records or to interpret tests in a timely manner poses a direct threat to the safety of his patients.¹³⁰ Similarly, the law will not accommodate a truck driver hired to haul highly inflammable gasoline in an eighteen-wheeled semi-tractor trailer because he loses concentration and memory while driving.¹³¹

127. See AM. PSYCHIATRIC ASS'N, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS 417 (4th ed. 1994).

128. See Larry A. DiMatteo, *The Counterpoise of Contracts: The Reasonable Person Standard and the Subjectivity of Judgment*, 48 S.C. L. REV. 293 (1997) (offering an in-depth analysis of the construction of the reasonable person).

129. Deirdre M. Smith, *The Paradox of Personality: Mental Illness, Employment Discrimination, and the Americans with Disabilities Act*, 17 GEO. MASON U. CIV. RTS. L.J. 79, 102 (2006).

130. *Robertson v. Neuromedical Ctr.*, 983 F. Supp. 669, 674 (M.D. La. 1997), *aff'd*, 161 F.3d 292 (5th Cir. 1998), *cert. denied*, 526 U.S. 1098 (1999).

131. Jeffrey A. Van Detta, “Typhoid Mary” Meets the ADA: A Case Study of the “Direct Threat” Standard Under the Americans with Disabilities Act, 22 HARV. J.L. & PUB. POL'Y 849, 895 (1999).

IV. TEMPORAL INERTIA

This section presents the principle of temporal inertia that law exemplifies, creates, and enforces in various forms. Law maintains temporal inertia by resisting or refusing to acknowledge changes. Temporal inertia assures that circumstances will remain the same or will be minimally altered over a period of time (Δt). This inertia is as much a human need as is change. Perpetual change, particularly when disorderly, devolves into chaos. Even well-structured change can cause disorientation when it occurs at a rapid speed. Empirical psychology documents that powerful cognitive tendencies encourage entrenchment of the status quo.¹³² The status quo ensures that what is familiar—whether landmarks of a town, values of culture, or rituals of religion—remains unchanged and forwards a desire for stability and continuity. Although law is an instrument of change, it is also an anchor for stability. Laws fortify the status quo. Ordered liberty contains elements of the status quo and serves as an indispensable matrix for social organization.

While temporal inertia preserves what is familiar, what is familiar may lose its appeal. The beneficiaries of the status quo make every effort to resist change. Rarely, though, is the status quo good for everyone. Although the status quo may cultivate the welfare of the entire community, opponents may still argue for improvement. Conflict arises when the community is fractured over the status quo, and when the status quo harms sections of the community, reformative calls become louder.

For this discussion, temporal inertia is defined as the law's interest to maintain its efficacy over a period of time (Δt) unless repealed, overruled, or put to nonuse. The law's inertia measured over a period of time (Δt) resists changes. The underlying theme of this study illustrates that temporality itself does not resist change, but is a tool to measure the resistance to change. Different laws accumulate different amounts of inertia. Some laws are hard to change while others are transient. In 1896 (t_1), the United States Supreme Court upheld the racially inspired "separate but equal" doctrine.¹³³ The doctrine's inertia lasted for nearly fifty-eight years (Δt) until it was overruled in *Brown v. Board of Education*¹³⁴ (t_2). By contrast, the First Amendment of the United States Constitution carries enormous inertia since it would be difficult to modify or repeal or change its basic meaning in the foreseeable future.

Seemingly contradictory, law responds to timeframe changes (Δt) in two distinct and opposite ways. In one instance, the law maintains temporal inertia and resists timeframe changes (Δt). In another, the law overcomes temporal inertia and adapts to timeframe changes (Δt). A legal system that does not change

132. Charles F. Sabel & William H. Simon, *Destabilization Rights: How Public Law Litigation Succeeds*, 117 HARV. L. REV. 1015, 1075 (2004).

133. *Plessy v. Ferguson*, 163 U.S. 537 (1896).

134. 347 U.S. 483 (1954).

with time can lose its dynamism and relevance. However, a legal system that is highly responsive to timeframe changes (Δt) may forfeit some stability and certainty. Normally, however, the law maintains a balance between the status quo and timeframe changes (Δt).

A. *Systemic Stability*

Temporal inertia is law's core attribute. It ensures the systemic stability of law because one primary purpose of law is to provide stable rules that do not change over a period of time (Δt). Temporal inertia preserves existing laws against durational changes (Δt) and also resists the formation of new laws. Systemically, law is the opposite of arbitrariness because arbitrariness carries no temporal inertia. Without temporal inertia, law is an arbitrary and fickle order that can change without timely notice.

Historically, temporal inertia has played multifaceted roles in the formation of laws. For example, community customs are normative habits that emerge and solidify over a period of time (Δt). A practice that withstands the tug of durational changes (Δt) matures into a binding custom. Customs are rarely made in an instant. The more enduring the resistance to durational changes (Δt), the more entrenched the custom. Likewise, customary international law draws its continued validity from state practices that persist over a period of time (Δt). In addition to local and international customs, certain trade usages, business customs, and banking and accounting practices garner legitimacy over a period of time (Δt). Only with the passage of time are these practices taken to be part of laws and normative behavior. Common law is also a time-consuming phenomenon as judges take decades first to articulate and later to refine the scope of holdings. These holdings are further tested through an extended appellate process. Case law evolves over extended periods of time (Δt). These examples demonstrate how law utilizes the passage of time (Δt) to generate new rules.

Most modern legal systems use what can be called "a legislative machinery" to manufacture laws. Just as machines have replaced handcraft, legislation has succeeded custom. Law is seldom made through the customary behavior of communities, but is often made through designated institutions.¹³⁵ Rapid legislation has replaced, albeit not entirely, the slow-moving formation of community customs. Even institutional legislation, however, faces temporal inertia when competing special interest groups marshal resources to influence lawmaking. The debates on legislative floors over the merits and demerits of proposed legislation consume great amounts of time. If a bill is vetoed, it faces temporal inertia that may or may not be overcome. Although lawmaking through

135. See generally Robert A. Katzmann, *The American Legislative Process as a Signal*, 9 J. PUB. POL'Y 287 (1989).

institutions is swift, it can face durational (Δt) resistance. Bills may die in the legislature and treaties may not be ratified for years.¹³⁶

Once laws have been made, whether through community customs or through legislative machinery, they acquire a new type of temporal inertia. Each custom and each piece of legislation is ordinarily made for an indefinite period of time (*ind.* Δt). This indefiniteness spawns social expectations that laws will remain constant. Customs maintain their own temporal inertia because they are hard to make and even harder to unmake. On the other hand, legislation is easier to create as well as to repeal. Therefore, temporal inertia, with respect to legislation, is relatively fragile at both ends, before and after its promulgation. Unstable legislative institutions that frequently modify or repeal laws undermine the law's temporal inertia as well as the confidence in the stability and continuity of laws.

Every legal system possesses a set of core laws assuring stability and continuity. Constitutional systems in which ordinary laws must conform to the constitution create a more reliable systemic inertia that prevents shifting legislative majorities from dramatically altering core laws. Individuals, companies, and other entities manage their social and economic affairs on the assumption that core laws will not change in the foreseeable future. A legal system in which core laws can be identified with clarity reinforces its own systemic inertia and generates compliance and respect.

The law's temporal inertia, though highly desirable for systemic stability, is in tension with the constant flux of natural and human affairs. The Theory of Relativity instructs that an object can be stationary from one point of reference but is in motion from another. The object's motionlessness is not absolute; it is relative. Likewise, a law's inertia is rarely absolute. Social, political, and economic forces continue to evolve, change direction, and regroup. Changes that occur over a period of time, that is, durational changes (Δt), can weaken the law's inertia. The tension between the law's temporal inertia and durational changes is most pronounced when laws no longer respond to social, political, or economic changes. This failure to respond to the needs of the community can be corrected either by dismantling durational changes (Δt) or by enacting new laws that correspond to such changes. A dynamic legal system allows laws to change with time and to adapt to durational changes (Δt).

In the United States, for example, the traditional notion of marriage as a legal union between one man and one woman is in controversy as social forces contest for a broader definition. Although some jurisdictions recognize same-sex marriages,¹³⁷ polygamy is still an unacceptable notion of marriage in the United

136. See Eric Lane, *Legislative Process and Its Judicial Renderings: A Study in Contrast*, 48 U. PITT. L. REV. 639, 646-47 (1987) ("Once a bill has been introduced, it is referred to a committee where the vast majority of bills are gratefully allowed to die. For example, of the 9,624 bills introduced in the New York State Senate in 1986, only 1,852 bills passed the senate, while only 265 bills were actually signed into law.")

137. See *Godfrey v. Spano*, 15 Misc. 3d 809, 2007 N.Y. Slip Op. 27105 (upholding a county executive order recognizing out-of-state same sex marriages).

States. However, the courts must deal with plural common law marriages for inheritance purposes.¹³⁸ Temporal inertia is instructive in the struggle to redefine marriage since law's inertia opposes durational changes (Δt), and attempts to keep the traditional definition of marriage stable. A federal law has been enacted to reinforce the traditional conception of marriage.¹³⁹ Ironically, the Defense of Marriage Act departs from common law that defined marriage as "the voluntary union *for life* of one man and one woman, to the exclusion of others."¹⁴⁰ The common law required *for life* (Δt) in the definition, a component that reflected an era when divorce was highly unusual.

The law may employ short-term temporal inertia to obstruct specific changes. It may designate a tract of time (Δt) within which a specified action must not be undertaken. The United States Constitution provides: "The President shall, at stated Times, receive for his Services, a Compensation, which shall neither be increased nor diminished during the Period for which he shall have been elected, and he shall not receive within that Period any other Emolument from the United States, or any of them."¹⁴¹ This constitutional provision does not prohibit changing the President's pay, which has indeed been periodically raised.¹⁴² What the law prohibits is changing the compensation during the four-year term (Δt). In addition to this constraint, a tax may not be imposed that would reduce the President's compensation while in office.¹⁴³ The removal of financial incentives and disincentives during the term allows the President to discharge his duties without reward or punishment from Congress.

In other contexts, temporal inertia is an effective tool to inhibit certain activities. For example, a city ordinance may prohibit convicted sex offenders from entering public parks during the day for an indefinite period of time.¹⁴⁴ Juvenile curfews may prohibit minors from remaining on public property during curfew hours. These curfews raise complex constitutional questions concerning freedom of movement. Curfews demonstrate that minors have less liberty than adults,¹⁴⁵ which may also conflict with or even supersede parental authority to supervise their children.¹⁴⁶ On occasion, the temporal dimension of curfews is nonsensical. For example, night curfews will not eradicate juvenile crimes

138. See, e.g., *Romano v. Newell Recycling of San Antonio, LP*, No. 04-07-00084-CV, 2008 WL 227974 (Tex. App. 2008).

139. See Defense of Marriage Act, 1 U.S.C. § 7 (1996).

140. *Hyde v. Hyde & Woodmansee*, [1861-73] All ER 175, 175 (Con. Ct. 1866) (emphasis added).

141. U.S. CONST. art. II, § 1, cl. 7.

142. In 2001, the President's pay was doubled to \$400,000. This increase, however, was effective with respect to the President who took office on January 20, 2001. 113 Stat. 430, 478 (2000).

143. *The President and the Judges-Tax on Salaries of*, 13 Op. Att'y Gen. 162 (1869).

144. See *Standley v. Town of Woodfin*, 650 S.E.2d 618 (2007) (upholding the city ordinance).

145. David. A. Herman, *Juvenile Curfews and the Breakdown of the Tiered Approach to Equal Protection*, 82 N.Y.U. L. REV. 1857 (2007).

146. Laura A. Rosenbury, *Between Home and School*, 155 U. PA. L. REV. 833, 884-85 (2007) (arguing that most curfew restrictions are consistent with parental wishes).

committed during the day.¹⁴⁷ The above discussion demonstrates that the legal system uses temporal inertia in various ways to preserve systemic stability. It protects core laws and traditional values. It also blocks specific activities of select groups for definite and indefinite periods to maintain law and order.

B. Precedential Inertia

To preserve systemic stability, the doctrine of precedent disregards social, economic, and political changes. Similar cases, despite durational changes (Δt) between them, must be judged alike. Consider the temporal mechanics of the doctrine of precedent. If key facts of the two cases are substantially similar, precedent dictates that the holding of the past (t_1) case be applied to the present (t_2) case; the durational changes (Δt) between past (t_1) and present (t_2) cases are irrelevant. The doctrine has been praised as a principle of justice and stability, which safeguards settled expectations. In one sense, the temporality of precedent is past-oriented¹⁴⁸ since the past (t_1) holding controls the present (t_2) holding. Seen differently, precedent enforces timeless (∞) law that transcends the qualitative social difference between the past (t_1) and the present (t_2).

Legal systems that do not accept the principle of binding precedent presuppose that the past (t_1) case cannot be similar to the present (t_2) case. These systems would distinguish the two cases as set apart in serial time although the two cases can be similar in facts. In non-precedential systems, judges are not prohibited from applying the past (t_1) holding to the present (t_2) case; they are simply not obligated to do so. The duration (Δt) between the two cases may be short or long, but a short duration (Δt) can still fundamentally change the social, political, and economic contexts of the two cases. Because the intervening duration (Δt) can encompass change, including a revolution, judges are not required to strictly apply the past (t_1) holding to the present (t_2) case.¹⁴⁹

In earlier times, common law holdings were considered to be the part of the timeless (∞) natural law.¹⁵⁰ Once propounded, a common law holding persisted as a Newtonian object, existing in an unchanging state of motion. William Blackstone taught generations of common law lawyers that once the law in a case is declared, it becomes a “permanent rule” that no subsequent judge may vary.¹⁵¹ This articulation of strict precedent reasserts the past over the present and disregards changes associated with the passage of time (Δt).

147. *Ramos v. Town of Vernon*, 353 F.3d 171 (2d Cir. 2003).

148. See *Greenhouse*, *supra* note 1, at 1642.

149. Adrian Vermeule, *Common Law Constitutionalism and the Limits of Reason*, 107 COLUM. L. REV. 1482, 1494-95 (2007).

150. Daniel A. Farber, *The Supreme Court, the Law of Nations, and Citations of Foreign Law: The Lessons of History*, 95 CAL. L. REV. 1335, 1347 (2007).

151. WILLIAM BLACKSTONE, *THE COMMENTARIES ON THE LAWS OF ENGLAND* 68 (1776).

In the United States, the evolution of the doctrine of precedent is complex and much more controversial.¹⁵² Early jurists followed Blackstone's interpretation of the doctrine. However, attacks on formalism weakened the strictness of the doctrine. More recently, particularly under critical legal studies, precedent is regarded as "judicial preference."¹⁵³ Popular sentiment can also affect the longevity or demise of the precedent.¹⁵⁴ If the past holding (t_1) reflects the people's beliefs, and no powerful group strongly disputes its continual validity, the judiciary is unlikely to disturb that holding. If the past holding (t_1) evokes strong social opposition, the judiciary is under pressure to discard it. Ultimately, whether the past holding (t_1) withstands durational changes (Δt) depends upon the ideological composition of the reviewing court. For example, the *Roe v. Wade* holding on the permissibility of abortion might be overruled if more pro-life judges are recruited to the Supreme Court.

With the weakening of the doctrine of precedent, a new concept of "super-precedent" is emerging that reinforces the law's temporal inertia. Professor Michael Gerhardt explains that "[s]uper precedents are those constitutional decisions in which public institutions have heavily invested, repeatedly relied, and consistently supported over a significant period of time [Δt]."¹⁵⁵ Professor Barnett cautions against drawing a distinction between reversible precedents and irreversible super-precedents, warning that the holdings in *Dred Scott* and *Plessy* could have been super-precedents for their times.¹⁵⁶ Any notion of timeless (∞) precedents ignores and defies durational changes (Δt) by binding present and future generations to the normative preferences of past generations. In explaining Barnett's skepticism of super-precedents derived from originalism, Stras and Vehrs clarify that "historical and sociological factors provide the true inertia behind super precedents."¹⁵⁷

A strict view of the doctrine of precedent and super-precedent seems to ignore the impact of durational changes (Δt) that occur between the past (t_1) and the present (t_2) cases. Although the two cases are similar, they are located at different points on the serial time. Most important, the interval (Δt) between the two cases may have fundamentally changed the social context in which the past (t_1) case was decided. The law's temporality demands that the doctrine of precedent not be reduced to a mere legal method. It refuses to apply the doctrine if the durational changes (Δt) between the two cases are significant.

152. Frederick Schauer, *Precedent*, 39 STAN. L. REV. 571, 601-02 (1987).

153. See generally Eric J. Miller, *Judicial Preference*, 44 HOUS. L. REV. 1275 (2008).

154. Steven P. Croley, *The Majoritarian Difficulty: Elective Judiciaries and the Rule of Law*, 62 U. CHI. L. REV. 689, 708 (1995) (noting that elective judges are more responsive to popular will).

155. Michael J. Gerhardt, *Super Precedent*, 90 MINN. L. REV. 1204, 1205 (2006).

156. Randy E. Barnett, *It's a Bird, It's a Plane, No, It's Super-Precedent: A Response to Farber and Gerhardt*, 90 MINN. L. REV. 1232, 1244-47 (2006).

157. David R. Stras & Karla Vehrs, *Foreword*, 90 MINN. L. REV. 1232, 1150 (2006).

C. *Remedial Inertia*

The previous sections have examined law's systemic inertia that both constructs and maintains the validity of rules notwithstanding durational changes (Δt)—a property that permeates the Constitution, statutes, and precedents. This section discusses how law uses the concept of temporal inertia as a remedy in civil disputes. The remedial inertia is court-mandated cessation of activities for a period of time (Δt) that halts the commission of private wrongs.

In law, remedial inertia is implemented through judicial injunctions generally associated with tort law. Injunctions are important remedies provided under the law of equity. In nuisance cases, where common law damages constitute an inadequate remedy, courts may invoke equity and prohibit tortfeasors from continuing the nuisance. Instead of compensating an injury, prohibitive injunctions stop the nuisance altogether. In prohibiting tortious activities, the injunction provides a remedy for a period of time (Δt). Thus, the duration (Δt) is a constitutive element of injunctions. The injunctions may be granted for a definite (*def.* Δt) or indefinite (*ind.* Δt) period of time.

The legal concept of injunctions compels a party to enact or abstain from a particular action. Injunctions demand the initiation or the cessation of durational changes (Δt). Accordingly, injunctions are divided into two categories: mandatory and prohibitive. Mandatory injunctions force the defendant to undertake a beneficial activity. Prohibitive injunctions, more common than mandatory injunctions, force the defendant to stop a harmful activity. A prohibitive injunction first compels the defendant to stop engaging in harmful activity and then bans the harmful behavior for a period of time (Δt). In almost all cases, therefore, duration (Δt) is an essential part of injunctions. Preliminary injunctions suspend the action until the court makes a final decision on the merits. The duration (Δt) for a temporary restraining order is ordinarily shorter (ten days or less) than that for a preliminary injunction.¹⁵⁸ Permanent injunctions are granted for an indefinite period of time (*ind.* Δt).

By granting a prohibitive injunction, the court aims to prevent durational changes (Δt) that could otherwise permanently harm the movant's interests. For example, AT&T sought an injunction against a company engaged in selling illegal cable descramblers that allowed buyers to receive AT&T's cable television programming for free. AT&T also moved the court to freeze the company's assets. The purpose of the injunction was first to create and then to preserve a temporal inertia under which the company would be prohibited from committing piracy.

Remedial inertia is a useful concept. In addition to torts, it is granted in a wide variety of legal actions ranging from civil rights to intellectual property

158. For a distinction between the two concepts, see *AT&T Broadband v. Technology Communication Inc.*, 381 F.3d 1309, 1314 (11th Cir. 2004).

rights.¹⁵⁹ Remedial inertia also serves environmental law to stop the pollution of water and air. In each case, the court considers several factors before granting the remedy, including the occurrence of irreparable damage over a period of time (Δt).¹⁶⁰

V. TEMPORAL TRIGGERS

This section introduces the principle of time triggers. A time trigger (tt) is a point in time (t) that initiates or terminates a legal event. A time trigger (tt) activates or terminates laws, powers, rights, and obligations. The date when a statute comes into force is a time trigger (tt) event, as is the date when a statute's repeal becomes effective. Under the evolutionary laws of nature, change occurs gradually over a period of time (Δt). Nature in most cases prefers durational changes (Δt) over point in time (t) changes. The aging process in human beings is gradual and extends over a period of years (Δt), but nature can also have abrupt time trigger (tt) events. An earthquake that razes an entire city is one of nature's dramatic time trigger (tt) events. Storms, hurricanes, and tornados set off extraordinary changes in such a short time that they can be called time trigger (tt) events. Just like the forces of nature, the positive law, too, harnesses the transformative value of time triggers (tt).

The time triggers discussed in this section have been divided into two broad categories. One category of time triggers is allocative while the other is terminative. Allocative time triggers bring a law, legal action, power, right, or obligation into existence. Terminative time triggers terminate a law, legal action, law, power, right, or obligation. In other words, the law uses points in time (t) to allocate and terminate actions, powers, rights, and obligations. Some time triggers are enforced more strictly than others. A clear understanding of time triggers (tt) allows legal professionals to critically appreciate the purpose of laws.

A. Allocative Time Triggers

Treaties, constitutions, laws, regulations, and contracts come into force at a specific point in time (t). The Convention on the Prevention and Punishment of the Crime of Genocide, for example, entered into force on January 12, 1951.¹⁶¹ On June 21, 1788, New Hampshire submitted its ratification as the ninth state, which served as the time trigger (tt) for the establishment of the Constitution.¹⁶²

159. See Morton Denlow, *The Motion for a Preliminary Injunction: Time for a Uniform Federal Standard*, 22 REV. LITIG. 495 (2003).

160. Alfred L. Brophy, *Aloha Jurisprudence: Equity Rules in Property*, 85 OR. L. REV. 771 (2006).

161. Office of the High Commission for Human Rights, *Convention on the Prevention and Punishment of the Crime of Genocide*, http://www.unhchr.ch/html/menu3/b/p_genoci.htm (last visited Sept. 18, 2008) (on file with the *McGeorge Law Review*).

162. Article VII of the United States Constitution required the ratification of nine states for the establishment of the Constitution. See H. Richard Uviller & William G. Merkel, *The Second Amendment in*

A legal obligation derived from positive law begins at a definite point in time (*tt*), such as the promulgation of a statute or the signing of a contract. A legal obligation similarly terminates at a definite point in time (*tt*), such as when a statute is repealed or a contract is completely performed. Just as births and deaths of human beings can be clocked and registered, origination and termination of legal obligations can be charted in linear time. Akin to obligations, powers and rights arising from statutes and contracts may similarly be charted in serial time.

Law defies the concrete nature of serial time where past events cannot be altered and has retained the power to re-characterize past behavior. Most laws commence prospectively at a point in time in the future, but legislatures retain the authority to enforce laws retroactively, that is, from a point in time in the linear past (*rt*).¹⁶³ The United States Constitution prohibits *ex post facto* (*rt*) law.¹⁶⁴ Other Constitutional provisions also prohibit impairing past (*rt*) obligations.¹⁶⁵ Retroactive (*rt*) laws are often disfavored because they disturb social and individual expectations. Joseph Story considered retroactive (*rt*) laws unjust and contrary to the principles of the social compact.¹⁶⁶ Lon Fuller considered retroactive (*rt*) laws monstrous.¹⁶⁷

Retroactivity (*rt*) in market transactions has also been criticized. Manufacturers, for example, face numerous uncertainties arising from competition and consumers when marketing their products. Economic theorists also argue that retroactive laws create risk for manufacturers who introduce new products that those laws may eventually regulate or ban.¹⁶⁸

1. *Arbitrary Time Triggers*

The law uses arbitrary time triggers (*tt*) to allocate fundamental human rights, such as the right to life. Legal systems determine a temporal conception of life, declaring a point in time (*tt*) when life begins and when the corresponding right to life is triggered. The American Convention on Human Rights recognizes that the right to life begins at the moment of conception (*t_c*).¹⁶⁹ The Convention states, “Every person has the right to have his life respected. This right shall be

Context: The Case of the Vanishing Predicate, 76 CHL-KENT L. REV. 403, 486 (2000).

163. The New Testament proscribes retroactivity: “[W]here there is no law, there is no transgression.” *Romans 4:15*.

164. U.S. CONST. art. I, § 9, cl. 3.

165. Daniel E. Troy, *Toward a Definition and Critique of Retroactivity*, 51 ALA. L. REV. 1329, 1350 (2000).

166. See 2 JOSEPH STORY, COMMENTARIES ON THE CONSTITUTION OF THE UNITED STATES § 1398, at 272 (Melville M. Bigelow ed., 5th ed. 1994) (1891).

167. LON L. FULLER, THE MORALITY OF LAW 53 (1964).

168. David Frisch, *Rational Retroactivity in a Commercial Context*, 58 ALA. L. REV. 765, 771 (2007).

169. Organization of American States, American Convention on Human Rights art. 5, § 1, Nov. 22, 1969, O.A.S.T.S. No. 36, 1144 U.N.T.S. 123 (entered into force July 18, 1978).

protected by law and, in general, from the moment of conception. No one shall be arbitrarily deprived of his life.”¹⁷⁰

Defining the moment of conception (t_c) for the beginning of life is not universal to all legal systems.¹⁷¹ In the landmark case *Roe v. Wade*, Texas argued that life begins at the moment of conception (t_c) and that, “therefore, the State has a compelling interest in protecting that life from and after conception.”¹⁷² The Supreme Court in *Roe*, however, refused to accept Texas’s moment of conception (t_c) definition of life, stating that the judiciary cannot resolve the complicated question of when life begins since even experts in the disciplines of medicine, philosophy, and theology cannot reach any consensus.¹⁷³ As a result, in the United States, the controversy over the temporal initiation of life persists and is likely to remain unsettled for the foreseeable future.¹⁷⁴

Regardless of the temporal initiation (tt) of life issue, most legal systems count a person’s numerical age beginning from the date of birth (t_b). The date of birth (t_b) serves as a reference point for allocating legal powers, rights, and obligations. In Kansas, for example, no person is authorized to drive a motorized bicycle upon a state highway unless that person is at least fifteen years of age (tt_{15}).¹⁷⁵ The fifteen years (Δt) are measured from the date of birth (t_b).¹⁷⁶ The fifteenth birthday serves as the time trigger (tt_{15}) for the right to drive a motorcycle on the highway. More broadly, Kansas laws define the first eighteen years (Δt), counted from the date of birth (t_b), as the period of minority. During this period, minors cannot fully enjoy all of the rights and powers of adults. However, the rights of sixteen year-olds who are or have been married are more flexible. Such persons acquire the rights of an adult and are considered majority age for all matters relating to contracts, property rights, liabilities, as well as the capacity to sue and be sued.¹⁷⁷

The legislation that determines when a minor enters adulthood (t_{18}) is an arbitrary time trigger (tt). Although, there may be reliable socio-psychological evidence that most minors in a given culture develop into adults at (t_{18}), the

170. *Id.* art. 4(1).

171. In 1975, the West German Constitutional Court declared that life begins the fourteenth day after conception. *Abortion I Case*, 39 BVerfGE 1 (1975) (F.R.G.) (English translation available in *West German Abortion Decision: A Contrast to Roe v. Wade*, 9 J. MARSHALL J. PRAC. & PROC. 605 (Robert E. Jonas & John D. Gorby trans., 1976)).

172. 410 U.S. 113, 158 (1973).

173. *Id.*

174. In a subsequent case, *Webster v. Reproductive Health Services*, the Supreme Court refused to disturb the preamble of a Missouri statute that declared that life begins at conception, arguing that the preamble imposes no substantive restriction on abortions. 492 U.S. 490, 505 (1988).

175. KAN. STAT. ANN. § 8-235(d) (West 2007).

176. Furthermore, all age measurements are made with reference to the Gregorian solar calendar. In Saudi Arabia, which does not use the Gregorian calendar, the qualifying ages are measured according to the lunar calendar.

177. KAN. STAT. ANN. § 38-101 (West 2007). In Kansas, the courts have the power to confer the rights of majority on minors. *Id.* § 38-108.

trigger point (tt_{18}) is a faulty over-generalization because some minors may gain social maturity before turning eighteen (t_{18}), while others acquire it later.¹⁷⁸ Despite the difficulty of defining adulthood absolutely, the law must draw a line between minors and adults to allocate rights and obligations. As such, while no perfect consensus exists as to where that line must be drawn, turning eighteen (t_{18}) has emerged as a broadly recognized time trigger (tt_{18}).¹⁷⁹ By setting a specific time trigger (tt_{18}), the law draws a bright line in the interest of efficiency and administrative convenience.

The arbitrariness of time triggers (tt) is even more apparent concerning juvenile delinquents. The juvenile justice system was established to rehabilitate children who commit offenses before attaining the age of majority. The temporal definition of delinquency, however, varies dramatically in the criminal justice system. The duration (Δt) of innocence, that is, the incapacity to commit crime, ends as early as age six (tt_6). Several states prescribe no minimum duration (Δt) of innocence; therefore, a child of any age may be processed as a juvenile offender.¹⁸⁰

Increasingly, states prosecute children as adults.¹⁸¹ Some states allow the removal of ten year-old offenders to the adult criminal justice system.¹⁸² Almost all states allow sixteen year-olds or older to be tried as adults for a variety of offenses. Once a child is prosecuted as an adult, some states permanently terminate childhood status for subsequent offenses.¹⁸³ Contrary to popular belief, the transfer of children to the adult criminal justice system is not limited to violent crimes. The criminal prosecution of children is also allowed for non-violent offenses.

In striking down capital punishment for children below the age of eighteen, the United States Supreme Court in *Roper* drew a bright temporal line (tt) between pre-eighteen and post-eighteen persons.¹⁸⁴ The Court established the eighteenth birthday (tt_{18}) as the critical time trigger for deciding whether the death penalty may be imposed. If a person commits a capital crime before

178. Even the concept of adult maturity is a social construct, particularly in light of historical evidence that demonstrates how women and certain races were treated as permanent minors on the theory that they fail to enter adulthood and therefore would always need protection and guidance.

179. Convention on the Rights of the Child art. 1, Nov. 20, 1989, U.N. Doc. A/44/49. The Convention, however, leaves open the possibility that the age of majority may be attained earlier under the laws. *Id.*

180. See JUVENILE OFFENDERS AND VICTIMS: 2006 NATIONAL REPORT, OFFICE OF JUVENILE JUSTICE AND DELINQUENCY PREVENTION 114 (2006) [hereinafter JUVENILE OFFENDERS REPORT], available at <http://ojjdp.ncjrs.org/ojstatbb/nr2006/downloads/chapter4.pdf>.

181. Kathryn Lynn Modecki, *Addressing Gaps in the Maturity of Judgment Literature: Age Differences and Delinquency*, 32 LAW & HUM. BEHAV. 78 (2008).

182. In Kansas and Vermont, a ten year-old child may be removed from the juvenile justice system and transferred to the criminal court. JUVENILE OFFENDERS REPORT, *supra* note 180, at 114.

183. PATRICK GRIFFIN ET AL., U.S. DEP'T OF JUSTICE, TRYING JUVENILES AS ADULTS IN CRIMINAL COURT: AN ANALYSIS OF STATE TRANSFER PROVISIONS (1998), available at <http://www.ncjrs.gov/pdffiles/172836.pdf>.

184. *Roper v. Simmons*, 543 U.S. 551 (2005).

reaching her eighteenth birthday (tt_{18}), the death penalty cannot be imposed. If the same person commits the same capital crime after passing the time trigger (tt_{18}), the death penalty may be imposed. To support its ruling, the Court made the following arguments. First, the life span before the time trigger (tt_{18}) corresponds to a lack of maturity and an underdeveloped sense of responsibility.¹⁸⁵ It is for this reason, the Court argued, that persons below the time trigger (tt_{18}) are prohibited from voting, serving on juries, or marrying without parental consent.¹⁸⁶ Second, the life span before the time trigger (tt_{18}) is vulnerable to external influences and peer pressure.¹⁸⁷ Since people cannot extricate themselves from crimiogenic settings before the time trigger (tt_{18}), their level of culpability is less than that of an adult.¹⁸⁸ Third, one's personality is transitory before the time trigger (tt_{18}), and thus not fixed.¹⁸⁹ However, it is unclear how the third observation about the life span before the time trigger (tt_{18}) is distinguishable from the first. Any person who lacks maturity and has not yet developed a full sense of responsibility is inevitably in a transitory and infirm stage of personality development.

There is no empirical evidence to support the proposition that the eighteenth birthday (tt_{18}) magically transforms a person from immaturity to maturity, from having an underdeveloped sense of responsibility to a fully developed sense of responsibility, and from having a transitory personality to a fixed personality.¹⁹⁰

The arbitrariness of time triggers (tt) becomes morally disturbing and intellectually baffling when one examines the transference doctrine in light of the *Roper* reasoning. As noted earlier, the transference doctrine allows minors to be tried as adults. If a person who has not crossed the *Roper* time trigger (tt_{18}) is inherently less culpable for capital punishment offenses, it must be so for any other offenses for which the minor is tried as an adult. The transference doctrine is morally and legally justifiable only if it can be demonstrated that the minor acted as an adult and that the mind and the behavior of a criminal minor is no different from that of a criminal adult. If the eighteenth birthday trigger (tt_{18}) is indeed a qualitative sea change, the transference doctrine must be revisited and perhaps outlawed.

In defense of time triggers (tt), one might argue that in order to protect minors, law must draw a temporal line (t) to distinguish between minors and adults. Any such temporal line, whether drawn at the eighteenth (t_{18}) or sixteenth

185. *Id.*

186. *Id.* at 569.

187. *Id.*

188. *Id.*

189. *Id.* at 570.

190. Dorothy C. Adkins et al., *Moral Development*, 2 REV. RES. EDU. 108 (1974) (discussing the works of Jean Piaget and Lawrence Kohlberg on gradual moral development of children); see also Dennis Krebs & Janet Gillmore, *The Relationship Among the First Stages of Cognitive Development, Role-Taking Abilities, and Moral Development*, 53 CHILD DEV. 877 (Aug. 1982) (reviewing whether cognitive and moral developments are synonymous).

birthday (t_{16}) or at any other point in time (t), is arbitrary. Nonetheless, administrative convenience demands that time triggers (tt) furnish bright lines to allocate powers, rights, and obligations. If not, the law must evaluate each person on a case-by-case basis to assess whether the person has developed the requisite moral and intellectual maturity to enter into contracts, serve on juries, and cause culpable harm to others. Any such individualized assessment will be administratively unwieldy and economically wasteful.

Furthermore, even arbitrary time triggers (tt), once firmly placed in law, provide notice to the public in general and to target groups in particular that law will confer powers and rights and impose disabilities and duties at or before designated time triggers (tt). The state, for example, may disable persons under the age of twenty-one (t_{21}) from drinking alcohol. This law-based disability is arbitrary, perhaps more so in this case because the target group has already attained the age of majority (t_{18}) for numerous other rights and obligations.¹⁹¹ Despite possible incongruity in its social logic, the twenty-one year trigger (tt_{21}) provides public notice to alcohol merchants, families, and persons below the age of twenty-one (t_{21}) that the law bans consuming alcohol before reaching the permissible time trigger (tt_{21}). In the absence of any such time trigger (tt), the burden falls exclusively on families to supervise the young. This burden, in the absence of state enforcement assistance, would compound the stress of raising children, particularly if the families are already struggling.

Likewise, the state asserts its protective paternalism when it prescribes time triggers (tt) on the issuance of marriage licenses. The state supplements, or perhaps exclusively assumes, parental control in guiding teenagers with respect to early marriage. Instead of providing a more comprehensive or individualized counseling on the pitfalls of early marriage, the state relies on conveniently enforceable time triggers (tt) to exercise its protective paternalism. Some courts, however, have refused to invalidate marriages contracted before the prescribed time trigger (tt) on the theory that the state's power to issue a marriage license cannot be automatically interpreted to mean that the prescribed time trigger (tt) for the license is tantamount to the minimum statutory age for marriage.¹⁹² The state, however, may prohibit marriages before intended spouses cross the prescribed time trigger (tt).

The treatment of person over forty (t_{40}) raises issues similar to those associated with minors. As previously mentioned, the rise and decline of physical and mental energy follows a bell-curve. The bell-curve, however, is rarely symmetrical. On the downside, each person declines differently as some faculties weaken before others. One's physical strength deteriorates long before mental

191. Note, however, that twenty-one has been for centuries the common law age of majority. See T. E. James, *The Age of Majority*, 4 AM. J. LEGAL HIST. 22, 28 (1960). By the time of the Magna Carta (1215), the age of majority was raised from fifteen to twenty-one for a legion of reasons, including the profession of arms that demanded strength. *Id.* at 26.

192. *State v. Sedlack*, 787 P.2d 709 (Kan. 1990).

ability. Yet, age is not aging. A numerical age does not tell the whole story. Should the law ignore numerical age and treat each person as an individual? Or should the law, for administrative efficiency and convenience, draw reason-based age lines (*tt*) and thereby withdraw powers and opportunities?¹⁹³

The United States Supreme Court upheld a Massachusetts statute that required uniformed police officers to retire at age fifty (*tt*₅₀).¹⁹⁴ Uniformed police officers perform arduous tasks. They control prison disorders, respond to natural disasters, and apprehend criminal suspects. Robert Murgia, the police officer who challenged the statute, conceded that a general relationship exists between advancing age and decreasing physical ability.¹⁹⁵ Murgia, however, argued that the statute was over-inclusive and made no distinctions based on actual performance. Murgia was physically fit and had passed various physical examinations. Rejecting the argument of individual performance, the Court reasoned that the state may draw age lines (*tt*) for mandatory retirement. These temporal triggers (*tt*) cannot be perfect.¹⁹⁶ The Court did not hold that the statute was “humane” or “wise” or that a more individualized evaluation of each uniformed officer would be cost prohibitive. The Court simply concluded that the state time trigger (*tt*₅₀) was rational and therefore constitutionally permissible.

Time triggers (*tt*) permeate laws and judicial decisions. An awareness of time triggers (*tt*) allows lawmakers and judges to rationalize policy options and decisional outcomes. This awareness also empowers the legal academy to furnish constructive criticism.

2. Temporal Competition

The law uses the concept of temporal competition to test and compare intelligence, knowledge, performance, and productivity. In track and field, for example, temporal competition is frequently the “name of the game.” All participants in a race begin at the firing of the time trigger (*tt*). Each participant’s performance in the race is measured in duration (Δt). The athlete who wins the race is the one who runs the distance in the shortest timeframe (Δt). A record is an acknowledgment of the shortest timeframe (Δt) in which the race has been

193. The law prohibiting age discrimination in employment rejects stereotypical assumptions attached to numerical age above forty. Congress found that age discrimination shared little ground with “insidious discrimination based on race or creed prejudices and bigotry.” *Duffy v. Wheeling Pittsburg Steel Corp.*, 738 F.2d 1393, 1399 (3d. Cir. 1984). Discrimination against older persons is rooted not in prejudice but in unsubstantiated claims that old age reduces performance. In addition, age discrimination is inextricable from the economic argument because older employees through years of service and experience demand higher wages than newer employees. Accordingly, employers in order to reduce the payroll expense may replace older employees with younger employees.

194. *Mass. Bd. of Ret. v. Murgia*, 427 U.S. 307 (1976) (the case was decided under the Fourteenth Amendment).

195. *Id.* at 310-11.

196. *Id.* at 314.

run.¹⁹⁷

Several professional tests, including the bar exam for law graduates, are conducted within specified timeframes. A specified timeframe (Δt) is a period of time during which a task must be completed. During the bar exam, the takers answer a set of questions within the prescribed timeframe (Δt). The timeframe is as much a part of the exam as is the taker's memory, knowledge, and exam taking skills. A test that must be completed within a short timeframe ($s.\Delta t$) rewards performance under temporal pressure.¹⁹⁸

The ability and skill to perform and produce under temporal pressure are highly prized in the markets.¹⁹⁹ Though law recognizes exceptions to temporal competition,²⁰⁰ many decisions in economics and finance are made under tight temporal pressure.²⁰¹ In stock markets, for example, millions of dollars may be invested in a matter of seconds.²⁰² Even in consumer markets, tight temporal pressures accompany sales at special and steep discounts.²⁰³ Companies offer huge contractual bonuses to top-level managers if they reach profit targets in a pre-specified timeframe (Δt).²⁰⁴ Auctions are founded on temporal pressure in that the auctioneer prompts bidders to make quick decisions if they wish to participate in the buying competition.

While temporal pressure is a key element of competitive markets, research shows that decisions made under timeframe (Δt) pressures have a negative effect on the quality of decision-making. Evidence derived from psychological research shows that temporal pressures impair the capacity to process information and make consistent decisions. Evidence derived from game theory-based research also shows that payoffs are lower when decisions are made under temporal pressure.²⁰⁵ Salespersons who engage in temporal pressures to close deals make fewer closings.

197. In 2005, for example, Asafa Powell set a new world record for the 100-meter dash with a time (duration) of 9.77 seconds. CBC sports, Asafa Powell Breaks 100-metre Record, June 15, 2005, <http://www.cbc.ca/sports/story/2005/06/14/powell050614.html> (on file with the *McGeorge Law Review*). In 1912, the record for the race was 10.6 seconds.

198. Ron M. Aizen, Note, *Four Ways to Better IL Assessments*, 54 DUKE L. J. 765, 781 (2004).

199. Jennifer Jolly-Ryan, *Disabilities to Exceptional Abilities: Law Students with Disabilities, Nontraditional Learners, and the Law Teacher as a Learner*, 6 NEV. L. J. 116, 128 (2005).

200. Persons with attention deficit hyperactivity disorder (ADHD), however, frequently request to opt out of temporal competition. They claim that the disorder disables them from performing well within the prescribed timeframe (Δt). The courts allow accommodation if a person with a legally recognized disability is unable to engage in temporal competition. *Sutton v. United Air Lines, Inc.*, 527 U.S. 471, 487 (1999).

201. Martin Kocher & Matthias Sutter, *Time is Money: Time Pressure, Incentives, and the Quality of Decision-making* (Jan. 2004), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=505242.

202. Roberta S. Karmel, *Mutual Funds, Pension Funds, Hedge Funds and Stock Market Volatility—What Regulation by the Securities and Exchange Commission Is Appropriate?*, 80 NOTRE DAME L. REV. 909, 927 (2005).

203. Black Friday sales, however, are (t) pressure and not (Δt) pressure sales for consumers have to go early in the morning to stores to get the products they want, even though the sales last all day long.

204. Kocher & Sutter, *supra* note 201, at 1-2.

205. *Id.* at 22.

Perhaps mimicking the competitive markets, law uses temporal competition to allocate preferential rights. The metaphor of a race is appropriate to understand the concept of temporal competition in law; one who crosses the finish line first wins and beats those who cross the line later. In law, however, the finish line is temporal, not spatial. Furthermore, as discussed below, temporal competition is skewed because law does not require that competitors begin the race at the same point in time (t).

The law of secured transactions, for example, uses temporal competition to rank security interests and agricultural liens in the same collateral.²⁰⁶ First, the very act of entering temporal competition is rewarded. Lenders are not required to enter the temporal competition.²⁰⁷ Nor are they required to start the competition at the same moment (t). However, lenders who do not compete lose out to others who do.²⁰⁸ By filing a financing statement with a designated office, each lender-competitor furnishes a notice to the public and other lenders that the lender-competitor has acquired a security interest in the debtor's personal property.²⁰⁹ Each properly filed financing statement perfects the corresponding security interest. A lender who does not file is likely to have an unperfected security interest.²¹⁰ Entering the temporal competition is thus rewarded since each perfected security interest ranks above all unperfected security interests.²¹¹

If all lenders enter the temporal competition and perfect their respective security interests, the law of secured transactions uses the "first in time" time trigger to rank perfected security interests.²¹² A security interest perfected at an earlier point in time (t_1) is senior to the one perfected at a later point (t_2), which would be senior to a security interest perfected at an even later point in time (t_3), and so on.²¹³ The point in time (t) competition is so fundamental to the ranking of security interests that the law allows lenders to file a financing statement, though with the debtor's permission, even before entering a security agreement.²¹⁴ This allowance empowers lenders to secure their ranking in the temporal competition. The seniority rights obtained through temporal competition are honored not only in ordinary default situations but also in bankruptcy proceedings.²¹⁵ The most

206. Keith G. Meyer, *Kansas's Unique Treatment of Agricultural Liens*, 53 U. KAN. L. REV. 1141 (2005).

207. Lenders may choose to furnish unsecured credit.

208. U.C.C. § 9-322(a)(1) (2001).

209. The security interest remains perfected for a statutory period of five years (Δt). U.C.C. §9-515 (2001).

210. Filing, however, is not the only way to perfect security interests. Law also recognizes perfection by possession of the collateral and automatic perfection for consumer goods. Furthermore, perfection cannot occur unless the security interest has attached to the collateral.

211. U.C.C. §9-322(a)(1) & (2) (2001).

212. *Id.*

213. Just a reminder to readers that the discussion throughout this Article assumes that (t_1) occurs before (t_2), and so on.

214. U.C.C. § 9-502(d) (2001).

215. Bankruptcy Code, U.S.C. § 547(c)(3) (1978).

senior holder of a perfected security interest, that is, the (t_1) holder, is the first creditor to be fully paid out of the value of the collateral. The (t_3) creditor must wait until the (t_1) and (t_2) creditors are fully paid.

Law also embraces the “first in time” time trigger (tt_1) to allocate water rights, natural resources, and even territory. For example, the person first in time (tt_1) to divert the water from a river for a beneficial use obtains senior rights.²¹⁶ The senior rights are secure even during drought times.²¹⁷ The “first in time” trigger (tt_1) has also been a defining principle in capturing natural resources. The rule of capture is thus related to temporal competition, even though it has a non-temporal dimension as well. In the case of surface water, for example, “the first in time” (tt_1) rule has been applied to allocate the use-appropriation of water. In the case of groundwater, however, the rule of capture replaces the “first in time” trigger (tt_1).²¹⁸ The “first in time occupier” (tt_1) provides title to territory that no other person has yet claimed.²¹⁹

B. *Terminative Timeframes*

In contrast to allocative time triggers (tt), terminative timeframes end powers, rights, obligations, and claims. Law abhors procedural delay, just as justice abhors the law’s delay. If an event does not take place at the scheduled time (t_1), the event is delayed. If the event does not take place at all, the event is canceled rather than delayed. To measure delay, law prescribes terminative timeframes ($t.\Delta t$) within which the various phases of a legal action must be processed. Each terminative timeframe expires with a deadline (t_d). Once the deadline (t_d) is crossed, the legal action is barred. Some terminative timeframes ($t.\Delta t$) are enforced more stringently than others.

Law employs three related, though distinct, temporal devices—limitation statutes, laches, and reasonable time—to control unacceptable delays.²²⁰ Limitation statutes are the legislative timeframes within which specified claims may be litigated.²²¹ Laches and reasonable time, enforced through courts,

216. See DAVID H. GETCHES, *WATER LAW IN A NUTSHELL* 74 (3d ed. 1997).

217. See *id.*

218. The rule of capture analogizes underground resources, such as water, oil, and gas, to wild animals. “If you can get it out of the ground, it’s yours.” Robert Glennon, *Tales of French Fries and Bottled Water: The Environmental Consequences of Groundwater Pumping*, 37 ENVTL. L. 3, 4 (2007). These two separate systems of allocation ignore the hydrological fact that surface water and ground water are “inextricably linked.” *Spear T Ranch, Inc. v. Knaub*, 691 N.W.2d 116, 125 (Neb. 2005).

219. This temporal rule was justified with sophisticated philosophy. In appropriating native lands from indigenous populations in America, Australia and other places, the first occupier principle was reinforced with additional self-serving assumptions. The indigenous populations lost their property rights because they were declared to be unbelievers or simply non-existent.

220. Laches is used primarily in equity claims while the concept of reasonable time is used in the motion practice.

221. “Statutes of limitations first appeared in English law as early as 1236.” Peter G. Brassard, Comment, *Is There a Statute of Limitations for Skiing on Filled Wetlands? Interpreting 28 U.S.C. § 2462 After*

disallow the prosecution of stale cases and delayed actions. Statutes of limitations provide a mathematically calculable deadline (t_d), whereas the deadline (t_d) in laches and reasonable time is more open-ended. Unlike a limitation statute, the doctrines of laches and reasonable time do not rely on preset timeframes (Δt). The courts consider multiple factors in determining whether the deadline (t_d) in the cases of laches or reasonable time has passed. Law provides a defense if cases are not filed before the deadline (t_d).

Litigation involving statutes of limitations often involves disputes over the temporal running of the statute. The limitation statutes set different terminative timeframes ($t.\Delta t$) for different claims. A terminative timeframe ($t.\Delta t$) may vary from a few months to several years. To apply the specified statutory terminative timeframe ($t.\Delta t$) to a cause of action, however, law must fix the first day (t_f) when the terminative timeframe ($t.\Delta t$) begins to run.²²² As a broad principle, the first day (t_f) is the day when the cause of action arises. This broad principle, however, is further refined to determine a more precise first day (t_f). In tort actions, the first day (t_f) does not trigger until the tort is complete. In employment cases, the terminative timeframe ($t.\Delta t$) for appeal begins to run the day (t_f) the notice of an adverse decision is mailed to the employee.²²³ Under the continuing violation doctrine, the prescribed timeframe ($t.\Delta t$) for filing an action is triggered anew every time (t_f) a new wrong is committed.²²⁴ In fraudulent misrepresentation, the first day (t_f) does not occur until the targeted person acts upon misrepresentation to his or her detriment.²²⁵ The first day (t_f) for a continuing tort, such as trespass, flows with the tort and cannot be fixed at the beginning of the tort.²²⁶

Courts enforce terminative timeframes stringently in cases involving subject matter jurisdiction. A delayed filing deprives the court of its subject matter jurisdiction. The courts do not invoke notions of equity or justice or unique circumstances to extend the terminative timeframe ($t.\Delta t$) for subject matter jurisdiction.²²⁷

Similar to allocative time triggers (tt), terminative timeframes ($t.\Delta t$) are arbitrary and may defeat rather than serve the demands of justice. Two distinct reasons, however, may justify terminative timeframes and accompanying

United States v. Telluride Co., 23 B.C. ENVTL. AFF. L. REV. 885, 887 (1996).

222. See, e.g., Wallace v. Kato, 127 S. Ct. 1091 (2007) (noting that the (t_d) in case of false arrest in violation of the Fourth Amendment occurs at the time when the claimant is detained pursuant to legal process).

223. Smith v. Volte Mgmt. Inc., No. A07-0674, 2008 WL 224004 (Minn. App. 2008).

224. Taxi Connection v. Dakota, Minn. & Easter R.R. Corp., 513 F.3d 823 (8th Cir. 2008).

225. RESTATEMENT (SECOND) OF TORTS § 899, cmt. C (1979).

226. *Id.*

227. However, electronic filing imports micro temporality because computers can clock submissions in minutes and seconds. If a computer rejects a timely filing because of software glitches or some other technical errors in filing, the courts have presumed the filing to be timely since the computer, just like the court clerk, cannot reject filings for not being in compliance with the form. Farzana K. v. Ind. Dep't of Educ., 473 F.3d 703, 707 (7th Cir. 2007).

deadlines (t_d). The first reason highlights the time-based erosion of evidence. Observation confirms that material objects decay with time. Fresh produce begins to rot, losing its integrity and identity. Objects made out of sturdy materials such as wood and steel last longer, but cannot retain their integrity and identity for an indefinite period of time ($ind.\Delta t$). Memories, documents, and other forms of evidence are also fragile assets that lose their authenticity as time passes. Terminative timeframes assure that the evidence offered in support of a claim has not worn out. They prevent “the revival of claims that have been allowed to slumber until evidence has been lost, memories have faded, and witnesses have disappeared.”²²⁸ Terminative timeframes urge promptness in the prosecution of legal claims.

The second reason in support of terminative timeframes is the universal human desire to forgive and forget old injuries. As time passes, physical and psychological injuries heal. Some injuries heal faster than others. Some leave durable scars. Some get worse and consume the person. Injuries prompt victims to seek remedies. Law recognizes that each injury has a natural timeframe ($nat.\Delta t$) within which the victim is most likely to seek redress. Civil injuries involving monetary damages tend to heal faster than physical injuries, and people are more likely to forgive and forget such injuries in due time. Criminal injuries involving bodily harm or death are harder to forget and forgive. Terminative timeframes for the prosecution of criminal charges are therefore longer than the ones available to prosecute civil injuries. On the basis of this common knowledge, timeframes are created and defended. If a person seeks no remedy within the expected timeframe, either out of mercy, forgiveness, or sheer neglect, law intervenes to bar the prosecution of delayed claims.

Terminative timeframes may also be understood in terms of depreciation or perishability. Law recognizes depreciation, a concept under which income-generating assets lose market value over a prescribed timeframe ($t.\Delta t$). Natural assets lose market value over a timeframe (Δt) as well. A depreciating asset loses its value gradually over a timeframe (Δt). By contrast, a perishable asset may maintain full value until it has perished. Fresh eggs, for example, maintain full value until they go bad. Perishability is a more catastrophic event as compared to depreciation. Legal actions are more like perishable assets rather than assets subject to depreciation. Instead of gradually losing value, legal claims subject to statutes of limitation, laches, or reasonable time maintain their full value within the prescribed timeframe. However, once the deadline (t_d) passes, an otherwise valid legal claim meets a catastrophic fate and loses its entire value. A delayed legal claim, however, may be settled for a depreciated value.

228. *Order of R.R. Telegraphers v. Ry. Express Agency, Inc.*, 321 U.S. 342, 348-49 (1944).

VI. TEMPORAL COOPERATION

This section continues the discussion of law's temporality by presenting the principle of temporal cooperation. Law uses temporal cooperation in numerous contexts to add value to the utilization of spaces and assets. Temporal cooperation may be distinguished from temporal competition that allocates preferential rights. The concept and application of temporal cooperation, still under-developed in law, is founded on time-sharing. As the following discussion illustrates, temporal cooperation carries great potential for creating beneficial social goals through law.

The concept of temporal cooperation has been successfully used in agriculture to maximize the use of land.²²⁹ Research and practice demonstrate that not all crops compete with each other for the same soil resources. Similarly, the quantity of water that crops consume for growth is not the same. Furthermore, some crops deplete nutrients from the soil while others impart nutrients to the soil. Finally, these complimentary crops do not need to be grown within the same season (Δt). They are naturally predisposed to use the same tract of land on a rotational basis in successive timeframes ($1.\Delta t, 2.\Delta t \dots$). This time-sharing is a demonstration of temporal cooperation.²³⁰

For farmers, temporal rotation of crops is economically beneficial. Agricultural time-sharing is superior to fallowing, an agricultural practice where land is ploughed but not seeded. Fallowing is based on the notion that land needs rest to recuperate and prepare itself for the next crop.²³¹ Because of nonproductivity, fallowing constrains the farmer's income. In some cases, idle land produces idle workers, aggravating the farmer's loss. Crop rotation has been a more productive substitute for fallowing because the land remains in use throughout the year.

Agricultural time-sharing is also environmentally sound.²³² Crops growing in one season ($1.\Delta t$) modify the ground composition and prepare the soil for subsequent crops grown during the immediately following season ($2.\Delta t$). Through temporal cooperation, a life cycle is established in which each species of plants takes turns blossoming and exiting for the next species to follow. This cooperation assures rotational existence of cooperating plants.²³³ No two crops

229. George E. Battese & Wayne A. Fuller, *Determination of Economic Optima from Crop-Rotation Experiments*, 28 BIOMETRICS 781 (1972) (examining how crop rotation controls weeds, insects, disease, and soil erosion).

230. Talaat El-Nazar & Bruce A. McCarl, *The Choice of Crop Rotation: A Modeling Approach and Case Study*, 68 AM. J. AGRIC. ECON. 127 (1986) (presenting a model for plausible crop rotation).

231. M. B. Hammond, *The Southern Farmer and the Cotton Question*, 12 POL. SCI. Q. 450, 455 (1897) (complaining that no crop rotation was used to maintain the fertility of the land). The focus on slave labor rather than land also prevented the use of crop rotation. *Id.* at 456.

232. Wim H. Van der Putten, *Plant Defense Belowground and Spatiotemporal Processes in Natural Vegetation*, 84 ECOLOGY 2269 (2003).

233. Claude Lattaud, *Co-evolution in Artificial Ecosystems: Competition and Cooperation Using*

susceptible to the same diseases follow each other, thereby interrupting the incubation period for disease. Crop rotation breaks the cycle of pests and diseases. It makes it more difficult for insects to find food in each season (Δt).²³⁴

The law of property has successfully used the concept of temporal cooperation. Time-share interests in real estate, known as time-sharing, offer a new property concept inseparable from temporality.²³⁵ For example, some individuals and families do not have the means to buy expensive vacation homes. Furthermore, most owners use the vacation property for a limited duration (Δt), sometimes only once a year. Although the property sits unused for the remainder of the year, it still must be maintained. Time-sharing cures these temporal and labor inefficiencies²³⁶ by allowing several persons to pool resources to buy a vacation property and make an efficient investment.²³⁷ Law recognizes such co-ownership as “timeframe estates” (Δt . *estate*).²³⁸ The co-owners contract to use the timeframe estate (Δt . *estate*) on a rotational basis. Each owner is allocated a specified timeframe²³⁹ during which she can use the timeframe estate (Δt . *estate*) exclusively. The multi-owners are free to rent out the property for their respective allocated timeframes. With temporal cooperation, timeframe (Δt) is an integral part of ownership. While co-owners hold fee interests in timeframe estates (Δt . *estate*), each person enjoys an exclusive right to use the property for the prescribed timeframe on a rotational basis.²⁴⁰

Drawing on the concept of temporal cooperation, the following two sections examine the role of punctuality and flextime in coordinating people and resources.

A. *Punctuality Cooperation*

The idea of punctuality as a tool of temporal cooperation can be illustrated with a simple example.²⁴¹ Say a group of people plan to meet at a specified point in time (t). Punctuality requires that the group arrive at or slightly before the scheduled time (t). Thus, punctuality is a point in time (t) cooperation. If the group plans to meet for a specified duration of time (Δt), punctuality requires that

Allelopathy, in *ARTIFICIAL EVOLUTION* (Pierre Liardet et al. eds., 2004).

234. Matt Liebman & Elisabeth Dyck, *Crop Rotation and Intercropping Strategies for Weed Management*, 3 *ECOLOGICAL APPLICATIONS* 92 (1993).

235. Ellen R. Peirce & Richard A. Mann, *Time-Share Interests in Real Estate: A Critical Evaluation of the Regulatory Environment*, 59 *NOTRE DAME L. REV.* 9 (1983).

236. The co-owners share the cost of maintenance and take the tax advantage. *Id.* at 22.

237. The arrangement can be structured as fee interests or non-fee interests. *Id.* at 13-27.

238. UNIF. CONDOMINIUM ACT § 4-103 (2008).

239. Each allocated timeframe is a terminative timeframe ($t.\Delta t$).

240. The arrangement can be structured as fee interests or non-fee interests. Peirce & Mann, *supra* note 235, at 13.

241. Steven E. Clayman, *The Production of Punctuality: Social Interaction, Temporal Organization, and Social Structure*, 95 *AM. J. SOC.* 659 (1989) (noting that punctuality produces sociotemporal order).

the group be present at the scheduled start (t_1) of the duration (Δt). If a member arrives later than the scheduled start (t_1), the member has breached punctuality.

The notion of punctuality is related to the numeration of time. When time is measured in numbers, punctuality assumes precision. These numbers, both point in time (t) and duration of time (Δt), provide certainty. The counting of serial time in micro units (hours, minutes, seconds, and split-seconds) supports a digitalized framework of punctuality, which can be precisely enforced.²⁴² Numbers make it possible for events to start (t_1) and end (t_2) at scheduled points in time (t). The precise nature of numerical time enhances our awareness of punctuality.

Awareness of punctuality is both intersubjective and systemic. Attentiveness to numbers is the *sine qua non* of punctuality. The intersubjective awareness makes it possible for groups to respect the function of punctuality. Law encourages systemic awareness of punctuality. Law rewards compliance, penalizes breaches, and reinforces intersubjective appreciation of punctuality. Temporal cooperation thrives in communities and cultures that enforce punctuality.

Punctuality cooperation requires tools to measure time in micro units.²⁴³ Accurate clocks and watches are essential to micro temporality. The clock is an ancient invention, but the democratization of clocks and watches is a relatively recent human phenomenon. The broad and inexpensive availability of wrist watches has democratized micro temporality. Communities without micro-measurement tools cannot develop a sophisticated consciousness of time. Persons and communities sensitized to a more discriminating measurement of time develop a more sophisticated conception of time. The more refined the measurement of time, the more sophisticated the consciousness of time.

The availability of reliable watches and clocks is necessary but not sufficient in itself to create punctuality cooperation.²⁴⁴ Activities that require sensitivity to micro time cultivate sophisticated time-consciousness. Athletes who compete to win by the split-second develop a highly refined concept of time. If a person has an intellectual understanding of micro temporality but performs no activity that commands attention to micro units of time, his time consciousness may not be expressed as meticulously. In the United States, most people are sensitive to micro temporality. Even here, however, time consciousness is rarely refined to micro temporality, although people begrudge delayed services.²⁴⁵ In some

242. Start work at 6.00 A.M. is a more certain demand than start work in the morning.

243. William V. Dunning, *Reflections on Time*, 26 J. AESTHETIC EDUC. 93, 96 (1992) (crude watches produced crude punctuality and precise watches produced strict punctuality).

244. Eviatar Zerubavel, *The Standardization of Time: A Sociohistorical Perspective*, 88 AM. J. SOC. 1 (1982) (time must be disassociated from nature to appreciate temporality as a social invention).

245. Shirley Taylor, *Waiting for Service: The Relationship Between Delays and Evaluations of Service*, 58 J. MARKETING 56 (Apr. 1994) (delayed airline passengers rate delays negatively but mediate their negative evaluations with whether the service providers have control over delay and whether the customers can fill their time).

cultures, sensitivity towards minutes, let alone seconds, is not fully developed; consequently, activities and appointments are considered to be timely though they are delayed by several minutes or hours.²⁴⁶

Sociologists and social psychologists have studied punctuality in various cultures and have discovered that some cultures value punctuality while others do not.²⁴⁷ No single answer suffices to explain why some cultures attach high value to punctuality. Punctuality is not an innate cultural trait, it is an acquired behavior. A cultural sense of temporality may be rooted in metaphysical concepts of life. Fatalistic cultures may not stress attention to timeliness as much as those cultures that believe people have control over their lives. Logistical factors can also determine a cultural view toward punctuality. For example, public clocks and personal watches will have to be accurate and mechanically sound to disseminate and observe punctuality. Factors such as the availability and reliability of public and private transportation also affect the observance of punctuality. A culture's infrastructure has a large effect on its ability to engender punctuality, including the democratization of micro temporality consciousness.

While logistical factors influence a culture's orientation toward punctuality, the systemic equilibrium reinforces and preserves attitudes toward punctuality. The equilibrium creates mutual expectations and understandings, and group members adjust to maintain the equilibrium.²⁴⁸ If a culture places a high value on punctuality, its individuals observe punctuality to maintain the social equilibrium. Contrariwise, when a system does not encourage punctuality, people maintain the equilibrium by *not* observing punctuality.²⁴⁹ In either case, individual responses toward temporality maintain the desired equilibrium. It has been argued that no temporal equilibrium is innate to the culture. Observers suggest that the equilibrium of punctuality or non-punctuality is a choice that each culture is internally empowered to make or unmake.²⁵⁰

Part of equilibrium toward punctuality can be demonstrated through a community's laws. If the laws reward punctuality and punish tardiness, the cultural equilibrium of punctuality is reinforced. The functional presence of laws that enforce punctuality is a social symptom of the punctuality equilibrium. Rarely does a community use criminal law to enforce punctuality. Laws which enforce punctuality are frequently private laws, such as employment contracts. If employment contracts are tolerant of tardiness or contain no provisions which

246. The author has the personal experience of witnessing that even a delay of one hour is considered normal in Pakistan. Pakistanis living in the United States show the same trait in social gathering even though they are otherwise punctual in their jobs and businesses.

247. George J. Dudyca, *A Qualitative Study of Punctuality*, 9 J. SOC. PSYCHOL. 207 (1938); Robert V. Levine et al., *Perceptions of Time and Punctuality in the United States and Brazil*, 38 J. PERSONALITY & SOC. PSYCHOL. 541 (1980).

248. Kaushik Basu & Jorgen W. Weibull, *Punctuality-A Cultural Trait as Equilibrium* (2008), available at http://ssrn.com/abstract_id=317621.

249. *Id.*

250. *Id.*

enforce punctuality, the culture likely has not formed the punctuality equilibrium yet. If employment contracts are overly harsh in punishing tardiness, the culture may be in a transformative stage with intentions that its citizens be socially engineered to observe punctuality.

To maintain productivity and efficiency, some businesses sometimes employ disproportionate punishments for tardiness at the workplace. Consider the following case involving strict punctuality at the workplace.²⁵¹ Clairson Industries fired Tommy Holly, a paraplegic, for tardiness. Clairson manufactures disposable surgical tools using an assembly line. Holly, confined to a wheelchair, had worked for Clairson for seventeen years. Holly's job was to polish the molds after they came off the assembly line. The employees at Clairson punch in for work at a time clock located in the break room. To prevent both tardiness and overtime payments, Clairson's policy required employees to clock in within five minutes before the start of their shift (t_1). Holly's shift started at 7:00 a.m., so he had to clock in between 6:55 a.m. and 7:00 a.m. When Holly was late, it was only by a minute or so. While Clairson had accommodated Holly for years, its new policy to enforce strict punctuality was uncompromising.

The break room where the time clock was located was small and congested. Many tables were placed in the room so that employees could sit during the breaks. Due to the shortage of storage space, the company stored raw materials and finished products in the break room, congesting it further. Holly suffered great difficulty maneuvering his wheelchair through the tables to reach the time clock. Additional factors also contributed to Holly's tardiness. If it was raining, Holly would wait in his car for the rain to stop because he could not maneuver his wheelchair while holding an umbrella. Holly also suffered from incontinence. If Holly lost bowel control, he had to go back home to change clothes. On rare occasions, Holly was late by thirty minutes or more. Although Holly was eventually fired, he successfully litigated an ADA claim.²⁵²

B. *Flexitime Cooperation*

As Tommy Holly's case demonstrates, a workplace built around dogmatic temporality may achieve forced temporal cooperation, but it exacts high social and emotional costs from its employees. A rigid workplace temporality demands that employees arrive at a specified place at a specified point in time (t_1), work for a fixed timeframe (Δt), and leave at specified point in time (t_2). This inflexible control of entry, duration, and exit creates a spatiotemporal capsule—constructing sovereign borders of the workplace—within which employees discharge work obligations, without personal, familial, or social distractions. This temporal sovereignty produces an employer's monopoly over employees while

251. Holly v. Clairson Indus., LLC, 492 F.3d 1247 (11th Cir. 2007).

252. *Id.* The court ruled in favor of Tommy Holly. *Id.* at 1263.

they are at work for the prescribed timeframe (Δt). Employees who are unable or choose not to observe a workplace spatiotemporal construct are viewed as lazy, irresponsible, and deficient of a work ethic.

Workplace demands for punctuality may be functional or dogmatic. In assembly-line productions, for example, punctuality and its resulting coordination of time are indispensable for starting the shift. Unless all employees working on the assembly line are present, the shift cannot begin. One employee's tardiness can hold up the assembly line, thus spoiling efficiency and productivity. In such situations, punctuality is an essential ingredient of employment.²⁵³ By contrast, dogmatic punctuality exists for its own sake.²⁵⁴ It imposes a culture that demands timeliness from all employees regardless of functional needs.

Employees are much happier when allowed to custom-design their workspaces, workdays, and workweeks. A flexible concept of time, called flextime, allows employees to fulfill their obligations without a rigid temporality.²⁵⁵ Flextime does not diminish the value of obligations; it simply introduces convenience while minimizing unnecessary hardship on its participants. In fact, flextime promotes desirable social and economic relations; it also improves efficiency, productivity, employer-employee relationships, job satisfaction, and surprisingly reduces tardiness and absenteeism.²⁵⁶

Some businesses allow employees to work from home. Others prescribe no time schedules but empower employees to determine their own timeframes provided the assigned work is done satisfactorily. Under the innovative concept of flextime, work hours (Δt) are fluid entities that accommodate the differing needs of employees and employers—a form of temporal cooperation that leads to job satisfaction, loyalty, honesty, high morale, decreased absenteeism, and increased productivity.²⁵⁷ For example, early-risers can begin the workday before others come to work whereas commuters might opt to start later. When mothers with young children enter the workforce, they find it difficult to meet their family obligations because of the rigid timeframe (Δt) of the workplace. Working parents may need more temporal flexibility to carry out multiple tasks of the household. They may opt to work more compressed or dispersed hours.²⁵⁸

253. *Earl v. Mervyn's Inc.*, 207 F.3d 1361 (11th Cir. 2000) (stating that employee responsible for opening the store cannot be allowed to clock in any time she arrived).

254. *EEOC v. Convergys Customer Mgmt. Group, Inc.*, 491 F.3d 790 (8th Cir. 2007) (stating that employees may be accommodated with a different start time without breaching strict punctuality).

255. Melissa A. Childs, *The Changing Face of Unions: What Women Want from Employers*, 12 DEPAUL BUS. L. J. 381 (1999/2000) (noting that the increasing number of women with family obligations, who need flextime, will change the way unions engage in collective bargaining).

256. See generally David A. Ralston, *The Benefits of Flextime: Real or Imagined?*, 10 J. ORG. BEHAVIOR 369 (1989).

257. Jennifer L. Glass & Sarah Beth Estes, *The Family Responsive Workplace*, 23 ANN. REV. SOC. 289 (1997); E. Jeffrey Hill et al., *Finding an Extra Day a Week: The Positive Influence of Perceived Job Flexibility on Work and Family Life Balance*, 50 FAM. REL. 49 (2001).

258. Debbie N. Kaminer, *The Work-Family Conflict: Developing a Model of Parental Accommodation in the Workplace*, 54 AM. U. L. REV. 305, 351 (2004) (work-family conflicts may be accommodated through

Respect for punctuality and timeframes, however, remains a core value even under temporal cooperation arrangements. Flextime does not repudiate appointments and schedules, nor is it a license for workers to come and leave at will. In actuality, flextime prohibits arbitrariness or chaos at the workplace.²⁵⁹ An unstructured temporality devoid of regularity may even be hazardous to mental health.²⁶⁰ Temporal flexibility is a discipline that employees choose for themselves, though with the consent of the employer who must also be generous and innovative.

The concept of temporal cooperation may be extended to other areas as well.²⁶¹ For example, lenders may allow borrowers to pay off loans according to a flexible time schedule. Ordinarily, the non-payment of rent “when due” is a lawful reason to cancel the lease and evict the lessee. During catastrophic timeframes, however, law may mandate a more flexible rent payment schedule.²⁶² Even during normal timeframes, a time famine appears to have gripped the world, particularly in the fast-paced United States. “I don’t have time” is the anxiety of our culture.²⁶³ To mitigate time scarcity in life and under law, temporal cooperation derived from an intelligent organization of temporality is the clarion call.²⁶⁴

VII. CONCLUSION

This study of temporality offers a simple analytical distinction between point in time (t) and duration (Δt), the two basic elements of time. Employing an analytical framework derived from these two elements, the study presents the four general principles of law’s temporality. These principles explain how law uses the elements of temporality to define, construct, and manage legal relations. Great caution is necessary in the application of these principles. First, the principle of temporal correlation determines cause and effect to draw legally significant inferences. Although temporality causes no change of its own, events which occur within a short duration are presumed to be causally related. This principle simplifies the determination of causation in the material world. Though

flextime).

259. Dan R. Dalton & Debra J. Mesch, *The Impact of Flexible Scheduling on Employee Attendance and Turnover*, 35 ADMIN. SCI. Q. 370 (1990) (flextime reduces absenteeism).

260. PETER WARR, WORK, UNEMPLOYMENT AND MENTAL HEALTH (1987).

261. J. David Lewis & Andrew J. Weigert, *The Structures and Meanings of Social Time*, 60 SOC. FORCES 432 (Dec. 1981).

262. Erin E. Bohacek, *A Disastrous Effect: Hurricane Katrina’s Impact on Louisiana Landlord-Tenant Law and the Need for Legislative and Judicial Action*, 52 LOY. L. REV. 877, 890-91 (2006) (during disaster times leases may not be dissolved for non-payment of rent).

263. A Westlaw research in “allcases” data base retrieves 231 cases containing the time famine statement “I don’t have time” (as of March 12, 2008).

264. Leslie A. Perlow, *The Time Famine: Toward a Sociology of Work Time*, 44 ADMIN. SCI. Q. 57 (1999) (a crisis mentality and individual heroics are disruptive but interdependent work patterns that increase collective productivity).

a useful surrogate, the principle of temporal correlation cannot be used to ignore an evident lack of causation. Second, the principle of temporal inertia offers valuable insights into the dynamics of normative stability. Temporal inertia is the constitutive core of legal systems. An arbitrary system carries no temporal inertia since its laws can be changed anytime without notice or warning. Despite its obvious strength in the maintenance of normative stability, temporal inertia may obstruct the dynamics of change. The doctrine of precedent is anchored in temporal inertia. If the facts of a present case are similar to the one decided in the past, the doctrine of precedent mandates the application of the past rule. Temporality of precedent offered in this study urges judges to pay more sophisticated attention to temporal changes that might have occurred between the two points in time.

Third, the principle of temporal triggers elucidates how law uses the elements of temporality to both allocate and terminate powers, rights, and obligations. These triggers, though arbitrary, impart convenience and efficiency to the management of legal affairs. Since time triggers are administrative tools, they must not be used to defeat the demands of justice. Time triggers used in the juvenile system appear to be the most arbitrary with serious consequences for children. Judges must not allow these triggers to discount fairness in individual cases. Finally, the principle of temporal cooperation creates time-sharing activity which enhances productivity and the utilization of assets. This principle explains how both punctuality and flextime promote temporal cooperation. A workplace fortified with sovereign spatiotemporal borders is no longer a useful way to increase employee coordination and productivity. Employees must have the option to use cooperative flextime to enmesh work with socially gratifying lives. More generally, an intelligent understanding of temporality may alleviate the time famine that bedevils a fast-paced world. The study invites lawyers, scholars, and judges to explore just and sustainable connections between law and temporality.