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通识读本

时间简史

The History of Time

A Very Short Introduction

Leofranc Holford-Strevens 著

萧耐园 译

外语教学与研究出版社

FOREIGN LANGUAGE TEACHING AND RESEARCH PRESS

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Preface

The title of this book may suggest a survey of problems in philosophy or physics: whether time can have a beginning or an end; whether the laws of space-time cease altogether to apply in black holes; whether it would ever be possible to reverse the flow and change the past – a favourite fantasy with people who imagine that they alone would have the privilege of doing so, and forget that in the new improved past their parents might never have met.

These are indeed good questions, but no more my concern than the definition of time. About AD 268 the great Neoplatonist philosopher Plotinus observed that while we constantly talk about age and time as if we had a clear idea of what they were, when we investigate the question we find ourselves puzzled. The point was pithily restated some 130 years later by St Augustine: 'So what is time? If no one asks me, I know; if I seek to explain it, I do not.'

No pretence to greater wisdom is made in this book; whether time is a fourth dimension of the universe or a reified abstraction, whether it is continuous or atomistic, whether it can exist independently of motion to be measured, whether any meaning attaches to 'before' in the phrase 'before Creation' or 'before the Big Bang', are for others to determine. The same St Augustine, faced with the question what God was doing before he created the world, quoted, though he did not endorse, the jocular answer, 'Preparing hells for folk who invented clever

conundrums like that'; I shall not take the chance that a true word was spoken in jest.

Nor shall I consider whether time proceeds in a straight line or in cycles. Although it is not true that linear time was a Judaeo-Christian speciality, set against the cyclical time symbolized in late Graeco-Roman paganism as a serpent devouring its tail, some philosophers did speak of time in cyclical terms. That poses conceptual problems that I shall not discuss; rather I shall confine myself to time in its ordinary-language or man-in-the-street sense, and shall concentrate on the methods by which its passage is and has been measured.

VIII The English word 'time' may refer to a more or less closely defined period, from 'a short time', meaning not very long, to 'the time of the Pharaohs', some three thousand years; it may also refer to the 'indefinite continuous duration', as the *Oxford English Dictionary* expresses it, in which all events have taken place, are taking place, and will take place. This notion, the focus of Plotinus' and St Augustine's perplexity, presupposes a developed capacity for abstract thought; not only are various primitive peoples reported by anthropologists not to have such a concept of time, but in the epics ascribed to 'Homer' and dating from the 8th to 7th centuries BC that the Greeks regarded as the foundation of their culture, *chrónos* denotes only a lapse of time, not what we are tempted to think of as time itself. Nevertheless it already has that sense in the great Athenian lawgiver Solon of the early 6th century BC, who personifies it as a judge: 'in the court of Time'. Since then, this concept of indefinite continuous duration has been so familiar a concept to Western civilization that we find its absence unimaginable in any advanced culture; yet the case has recently been argued that neither the Hebrew Bible nor rabbinical literature displays it. However, in any but the simplest society, even if people are unaware of time as a thing in itself, they need to measure it. This book is about the methods by which the passage of time has been measured.

Homer has terms for years, months, and days; his references to disputes and lawsuits remind us of one important context for time-

measurement, namely that even in his relatively simple society some cases must have turned, not on whether something had happened, but on whether it had happened before something else. If the two events had been witnessed by the same persons, there might be no problem; if not, both might be related to some third event, preferably one known to both parties and the judge, such as the local magnate's wedding. If there were no such event, difficulties would ensue unless the facts of the case could be plotted against a socially accepted measure of time.

The recording and coordination of human activities make it necessary to devise systems for relating events to a sequence of regular and predictable natural recurrences; since these systems were of artificial contrivance, and evolved in partial or complete independence one from another, they are different in many details. The range of variation, however, is limited by facts of nature, in particular the earth's rotation on its axis, the moon's revolution round the earth, and the earth's revolution round the sun; it is these that underlie the most widespread units for measuring time, the day, month, and year respectively.

IX

The more complex life becomes, the more sophistication is demanded of the intellect not merely to distinguish one year, month, day, or subdivision of the day from another (the science of *time-measurement*), but to relate the years and so forth thus distinguished to each other (the science of *chronology*). This latter includes comparing the systems established for this purpose by different cultures to determine whether two apparently similar designations refer to two different things, or the same thing is lurking under two different names.

In much time-measurement fidelity to nature is in conflict with convenience; sometimes the former is sacrificed, as has repeatedly happened in Western methods of telling the time of day, sometimes the latter, as when Pope Gregory XIII made the Roman calendar more accurate but also more complex. By contrast, the designation of the year is free of natural considerations, being entirely a matter of convention; nevertheless, it is all too easily reified. In the early months of 1961 a manufacturer of electrical goods is said to have advertised its products

in the name of a housewife called 'Mrs 1961', who because she was Mrs 1961 had to have the latest vacuum cleaner and the latest refrigerator. Her reward for thus increasing the company's sales was to disappear without trace in 1962.

Mrs 1961 was a victim of the delusion that years measured in our particular calendar and numbered in our particular era possess a reality beyond the conventions that created them. Yet in other calendars the year 1961 of the Christian era was not even a self-contained whole: in one Indian era it combined portions of 1882 and 1883, in another of 2017 and 2018, in Ethiopia of 1953 and 1954, in the Jewish calendar of 5721 and 5722, in the Muslim calendar of 1380 and 1381.

X

Such reification extends to larger units. 'The Sixties', meaning the 1960s, marks an entire decade as a time of political rebellion and cultural innovation; the 1890s (during which Oscar Wilde was convicted) are called 'the Naughty Nineties' because the elite chafed at the pretence of conforming to middle-class respectability. Centuries too are branded: 'in the 15th century religious devotion became increasingly personal and emotional', '18th-century English literature was dictated by the head and not the heart' – as if on the first day of 1401 or 1701 (not necessarily 1 January, as we shall see in Chapter 7), old ways of thought and feeling were abandoned like Mrs 1961's old vacuum cleaner.

When the emperor Trajan admonished Pliny, perhaps late in AD 110, that receipt of anonymous accusations was not compatible with 'our times', he meant quite specifically 'my reign', the principles by which he chose to rule. By contrast, modern journalists and politicians tell us that certain practices of government (though not that one) have no place in the 21st century, as if the date were a fact of nature and a legislator, so solidly is it reified. One purpose of this book is to combat such reification by illustrating the contingent and arbitrary nature of the measures to which it is applied.

Although the subject of this book is not politics or religion, I shall as occasion serves consider the political and religious implications in the

choice of calendar, and the acceptance or rejection of reforms (e.g. the Gregorian calendar in Christendom, the 'Shahānshahi' era in Iran): even when the Government of India, in 1957, introduced a new secular calendar, it did not dare touch the multiplicity of religious calendars beyond substituting the synodic for the sidereal year. I shall also devote one chapter to a religious festival, the Christian Easter, not because of its religious significance but because of its calendrical complexity.

Nevertheless, my concern is with calendars as such rather than with their use or meaning; likewise, though much may be written about time as a social construct – and constructor – or about its perception by young and old, by men and women, or by office workers, factory hands, and peasants, there are others more qualified to write it.

XI

Technical terms, when unavoidable, will be explained in a glossary; however, I note here that I have occasionally employed the single words 'feria', 'quantième', 'lune', and 'millésime' in place of the lengthier phrases 'day of the week', 'day of the month', 'day of the lunar month', and 'number of the year'. Numbers have been written in the scientific fashion, without commas: one thousand is 1000, ten thousand 10 000, one ten-thousandth 0.0001, one hundred-thousandth 0.000 01.

The traditional terms AD and BC have been retained, in preference to CE and BCE, for two reasons: adopting the latter causes the maximally distinguished BC 1 and 1 AD to become the minimally distinguished 1 BCE and 1 CE; and although, as a date for the birth of Jesus Christ the epoch is almost certainly wrong, it remains a commemoration of that event, and no other event of the same year can be proposed as an alternative of world significance. Attractive, especially in a globalized age, as a purely secular era may appear, the Christian era cannot be made secular by denying its origin.

前言

本书的题目可能让人产生一连串哲学或物理学上的问题：时间是否会有开始或终结；在涉及黑洞的问题时，时空规律是否不再适用；让时间倒流、改变过去究竟是否可能——有人以为有独家本领可以这样做，热衷于这种幻想，却忘记了要是真的改变了过去，他们的父母也许永远不会相遇。

这确实是一些值得探讨的问题，但是我更为关注的是时间的定义。公元 268 年前后，伟大的新柏拉图主义哲学家柏罗丁¹评说道，尽管我们不断地谈论岁月和时间，似乎我们清楚地认识它们是什么，但当我们深入探讨之际，却感到迷惑不解。大约 130 年之后，圣奥古斯丁²又精辟地复述了这一点：“那么什么是时间？如果没有人问我，我知道；如果我试图解释它，我便茫然了。”

¹ 柏罗丁 (Plotinus, 205—270)，又译普罗提诺，古罗马宗教哲学家。公元 3 世纪时具有宗教天资的伟大哲人，将罗马帝国时期复苏的柏拉图主义改造成为新柏拉图主义，对于欧洲思想有广泛影响。——译注，下同

² 圣奥古斯丁 (Saint Augustine, 354—430)，又称希波的圣奥古斯丁。公元 396—430 年间任罗马帝国非洲希波主教，是当时西派教会中举足轻重的人物，公认为古代基督教最伟大的思想家。他把《新约》所揭示的信仰最完美地与希腊的柏拉图哲学结合在一起，又通过他的思想传输给中世纪的天主教和文艺复兴时代的基督教（新教）。他的著作甚多，有《忏悔录》、《上帝之城》、《书信集》、《讲道集》等。

本书不敢僭越先哲；时间是否宇宙的第四维抑或是具体化的抽象概念，它是连续的还是量子化的¹，它能否独立于运动而存在并被测量，在“创世之前”或“大爆炸之前”这类说法中的“之前”究竟有没有意义，凡此种问题统由他人回答。同一位圣奥古丁在面对上帝在创造世界之前做什么的问题时，虽然很不情愿，还是打趣地作了回答：“上帝正为提出这类刁钻难题的人准备地狱。”我不打算采取把实话说成玩笑这种方式。

我也不讨论时间的进程是直线的还是循环的。晚期希腊罗马的异教徒信奉时间轮回，好比一条蛇噬咬着自己的尾巴，犹太教和基督教则反对这种信仰，主张时间径直流逝；虽然并不仅仅是他们如此主张，但还是有些哲学家谈论时间的循环往复。这提出了一些概念问题，我将不予讨论；我只局限于论述日常语言中或街头巷尾谈论的时间，并将专注于正在和曾经采用的计量其进程的方法。

在英语中“时间”一词可以指大致确定的时段，例如说“短时间”，意思是不太长久，又例如说“法老时代”，则延续了大约3000年；它也可指“无限连续的持久”，正如《牛津英语词典》中的定义，一切事件在其中曾经发生、正在发生和将要发生。这一概念，正是柏罗丁和圣奥古斯丁困惑的焦点，预示着抽象思维的更高能力；不仅人类学家报告说许多原始民族不具备这种时间概念，而且在被认为由“荷马”²所著、自公元前8至

¹ 时间的连续和量子化指时间描述物质运动过程的次序和速度。在经典物理学中一切物理量（如质量、能量、动量等）都是连续和无限可分的，认为时间也具有同样的性质。但是在量子力学中，当人们考察原子内的亚微观体系时，物理学中的能量、动量、电荷等各种物理量取离散的天然单位，可观测值只限于由离散值构成的自然集合。这就是说，亚微观体系中的一切现象都显示量子化，包括时间。量子化时间的最小单位是 10^{-43} 秒。

² 荷马（Homer）指创作古希腊两大史诗《伊利亚特》和《奥德赛》的一个或几个诗人。但是有关荷马本人的史料贫乏，以致后来的学者不能确认真是这样。但是，说有一个史诗的作者名叫荷马，或他在史诗的形成上起主要作用却是很有可能的。

7世纪以来被希腊人看作其文化基础的史诗里，*chrónos* 这个词也只表示一段时间的流逝，而不是我们所认知的时间概念。尽管这样，公元前6世纪初伟大的雅典立法者梭伦¹已经有了这样的概念；他把时间拟人化为了法官：“在时间的法庭里。”从此以后，“无限连续的持久”这个概念在西方文明里相当流行，以至我们不可想象在任何发达的文化里会缺失这个概念；可是近来这一情况遭受争议，不论是《希伯来圣经》还是拉比著述都不曾体现这一概念。然而，在任何一个哪怕是最简单的社会里，即使人们还没有意识到时间本身作为客体的存在，他们也必需计量它。本书叙述如何计量时间的进程。

XIV

荷马已使用了年、月和日这些词；他提到一些辩论和诉讼，让我们认识到时间计量的一个重要背景，也就是说，即使在他的相对简单的社会里，某些案件也并非取决于某件事是否发生，而是取决于它是否在另外一件事之前已经发生。如果两个事件被同一些证人所目击，那么没有问题；如果不是这样，这两件事要能与第三个事件作对照，后者最好涉案两方和法官都知道，譬如当地豪门的一场婚礼。如果没有这样一个事件，困难便接踵而至，除非案件中的事实能以社会所接受的时间计量方式确定下来发生的先后顺序。

为记录和协调人类的活动必须设计一个体系，把所发生事件与一个规则而可预测的、天然而反复出现的序列联系起来；由于这些体系是人为设计的，而且彼此部分或完全独立地演变，它们在许多细节上各不相同。然而变动的范围受制于自然界的客观事实，特别是地球的绕轴自转、月亮绕地球的公转和地球绕太阳的公转；正是这些构成了计量时间的最普遍单位，相应于日、月和年。

¹ 梭伦 (Solon, 约公元前630—约前560)，雅典政治家和诗人。出身于贵族，并可能当过商人。约公元前594年任执政官。约20年后获得充分权力，着手改革和立法。

随着生活变得越来越繁复，对知识界提出了越来越复杂的要求，不仅要区分一年、一月、一日和一日里的更小时段（时间计量学），而且要在年份等这类时间单位间建立起相互关联（年代学）。后者包括比较不同文化为此目的而建立的各种体系，以便确定表面上类似的两种标示是否表示两个不同的事物，或者同一个事物隐藏在两个不同的名称之下。

时间计量与自然节律的符合程度常常与使用方便相冲突；有时候牺牲前者，例如在西方历法中对日这一时间单位的计量就往往是这样；有时候牺牲后者，例如教皇格列高利十三世（Gregory XIII）制定的罗马历更加精确，但也更加复杂。对比之下，年的标示忽略了自然节律，怎么做全按约定俗成；不过，它却太容易具象化了。在1961年的头几个月里，据说有一个电器制造商以一位家庭主妇“1961太太”的名义为他的产品做广告。正因为她是1961太太，她就应该拥有最新款的真空吸尘器和最新款的电冰箱。公司的销售额大增，但1961太太到1962年便销声匿迹了。

年在我们特定的历法中计量并按特定的纪元排序，使我们产生错觉，以为年具有一种现实性，足以超越制定它们的规约，1961太太正是这种错觉的牺牲品。其实在其他历法里，公历纪元的1961年甚至不能完整地包含在1年里：在一种印度纪元的历法里，它的头在1882年，尾在1883年，在另一种里则是2017年和2018年，在埃塞俄比亚历里是1953年和1954年，在犹太历里是5721年和5722年，在伊斯兰历里是1380年和1381年。

这样一种具象化还扩展到更大的单位。“六十年代”表示20世纪60年代，标志那政治反叛、文化翻新的整整十年的一个时期；19世纪90年代（在此期间奥斯卡·王尔德¹被判有

¹ 王尔德（Oscar Wilde, 1854—1900），爱尔兰作家、诗人、戏剧家。1895年被控与青年搞同性恋，被判入狱服劳役两年。

罪)被称为“肮脏的九十年代”,因为精英阶层对要装作接受中产阶级享有体面的社会地位感到极为不满。世纪也被贴上标签:“在15世纪宗教信仰日益成为个人的情感表现”、“18世纪的英国文学是用头脑而不是用心灵表现的”——就好像在说1401年或者1701年的第一天(不一定是1月1日,这一点我们将在第七章论述),旧的思想方法和情感就已被抛弃,如同抛弃1961太太的过时真空吸尘器一般。

约在公元110年末,当图拉真皇帝¹告诫普林尼²说接受匿名控告不适合“我们的时代”之时,他极具针对性地指的是“我的统治”,即他实施统治的原则。与之相比,现代的记者和政治家告诉我们政府的某些做法(尽管不是图拉真所说的那个)在21世纪不可行,似乎日期是一种天然和法定的事实,其具象如此地地不可移易。本书的目的之一是说明我们所应用的时间计量方法本质上是偶然的和任意的,以此揭穿它的具象化。

虽然本书的主题既非政治的,亦非宗教的,可是我将在方便时阐述选择历法以及接受或拒绝改革的政治和宗教含意(例如基督教世界采用格列高利历,伊朗采用Shahānshahi纪元):甚至在1957年当印度政府推行一种新的世俗历法时,它除了用阴历年代替恒星年之外,不敢触动各种各样的宗教历法。我还将用一章的篇幅专门讨论一个宗教节日——基督教的复活节,不是由于它的宗教意义,而是由于它在历法上的复杂性。

然而,我的阐述只涉及历法本身,而不涉及它们的应用或意义;同样,尽管关于时间作为社会的产物和构建者,或者关于它之于人的感知——年轻人和老年人、男人和女人、白领和

¹ 图拉真 (Trajan, 约53—117), 罗马帝国皇帝。

² 普林尼 (小) (Pliny the Younger, 61/62—约113), 罗马作家、行政官。出身富贵家庭, 为作家老普林尼的养子。曾受图拉真皇帝之命去比特尼亚调查官员的贪污腐化, 两年后死于该地。

蓝领、工人和农民等等，有着许多内容可写，还是把这些留给更有资格的人去写吧。

专业术语当其不可避免时，我会在书末的词表里加以解释；然而，我要在这里说明，我偶尔会使用单词 *feria*、*quantième*、*lune* 和 *millésime* 等代替冗长的词语“星期中的日期”、“月份中的日期”、“阴历月份中的日期”、“年份数”。数字则用科学方法表示，不加千分号：一千是 1000，一万是 10 000，万分之一是 0.0001，十万分之一是 0.000 01。

本书保留了传统的缩写 AD 和 BC，而不用 CE 和 BCE，这有两个理由：若采用后者会使得很容易区分的 BC 1 和 1 AD 成为不易区分的 1 BCE 和 1 CE；此外，虽然该历元作为耶稣基督生日的日期几乎肯定是错误的，它还是保留着对这一事件的纪念意义，而且在同一年内没有具有世界意义的其他事件足以取代。尽管一种纯粹世俗的纪元可能会显得十分有吸引力，尤其是在全球化的时代，但不能因想将基督纪元世俗化而否认它的起源。

Contents

目录

	Preface	vii
	List of illustrations	xix
1	The day	1
2	Months and years	18
3	Prehistory and history of the modern calendar	28
4	Easter	44
5	Weeks and seasons	64
6	Other calendars	86
7	Marking the year	108
	Appendices	131
	Further reading	135
	Glossary	138
	Index	140