TPO 6 – 1 Powering the Industrial Revolution
驱动工业革命

In Britain one of the most dramatic changes of the Industrial Revolution was the harnessing of power. Until the reign of George III(1760-1820), available sources of power for work and travel had not increased since the Middle Ages. There were three sources of power: animal or human muscles; the wind, operating on sail or windmill; and running water. "Only the last of these was suited at all to the continuous operating of machines, and although waterpower abounded in Lancashire and Scotland and ran grain mills as well as textile mills, it had one great disadvantage: streams flowed where nature intended them to, and water-driven factories had to be located on their banks whether or not the location was desirable for other reasons. " Furthermore, even the most reliable waterpower varied with the seasons and disappeared in a drought. The new age of machinery, in short, could not have been born without a new source of both movable and constant power.

在英国，工业革命带来的最大的变化之一就是动力的运用。从中世纪到乔治三世统治时期，用于劳作及行驶的动力一直没有得到发展。当时的驱动力仅限于三种：动物或人力；风力，用于航行或者风车；流水产生的动力。其中只有水力可以用于支持持续运转的机器，尽管在当时的兰开夏和苏格兰地区水力资源极其丰富，被用于谷物作坊和纺织厂，但这种动力存在一个极大的缺陷：水的流向是由自然因素决定的，因此，不论适不适合工厂选址，利用水利生产的工厂都必须建造在能够提供水资源动力的岸边。再者，即便是最可靠的水资源也会受到季节变化和因干旱而枯竭的影响。总之，没有可持续提供动力并且可移动的能源就没有新机械化时代的产生。

The source had long been known but not "exploited". Early in the eighteenth century, a pump had come into use in which expanding steam raised a piston in a cylinder, and atmospheric pressure brought it down again when the steam condensed inside the cylinder to form a vacuum. This ""atmospheric engine"," invented by Thomas Savery and vastly improved by his partner, Thomas Newcomen, embodied revolutionary principles, but it was so slow and wasteful of fuel that it could not be employed outside the coal mines for which it had been designed. In the 1760s, James Watt perfected a separate condenser for the steam, so that the cylinder did not have to be cooled at every stroke; then he devised a way to ***make the piston turn a wheel and thus convert reciprocating (back and forth) motion into rotary motion. He thereby transformed an inefficient pump of limited use into a steam engine of a thousand uses***. The final step came when steam was introduced into the cylinder to drive the piston backward as well as forward, thereby increasing the speed of the engine and cutting its fuel consumption.

一直以来，人们很早就了解这种能源，不过没能成功开发。在 18 世纪早期，泵曾被用于在气缸中使蒸汽推动活塞，气缸内部的蒸汽被压缩形成真空环境，大气压又使得活塞下降，这一由托马斯•赛佛瑞发明并由他的同伴托马斯•纽科门对其进行改良的“大气引擎”，被赋予了革命性的工作原理。但其效率低下且浪费燃料，无法在煤矿以外的地区使用，这与最初的设计期望

背道而驰。18 世纪 60 年代，詹姆士•瓦特完善了分离的蒸汽冷凝器，因此不必每次活塞运动后都要冷却气缸；随后，他又发明了一种新的方法，*使得活塞可以旋转运动，即从原来的往复运动演变成为循环运动，原本效率低下运用范围有限的活塞式结构从此演变成为得到广泛运用的蒸汽模式*。最终，蒸汽被运用于汽缸中将活塞推回，从而加快了机器的运转速度并降低了能源消耗。

Watt's steam engine soon showed what it could do. It liberated industry from dependence on running water. The engine eliminated water in the mines by driving efficient pumps, which made possible deeper and deeper mining. The ready availability of coal inspired William Murdoch during the 1790s to develop the first new form of nighttime illumination to be discovered in a millennium and a half. Coal gas rivaled smoky oil lamps and flickering candles, and early in the new century, *well-to-do* Londoners "grew accustomed to" gaslit houses and even streets. Iron manufacturers, which had starved for fuel while depending on charcoal, also benefited from *ever-increasing* supplies of coal: *blast furnaces with steam-powered bellows turned out more iron and steel for the new machinery*. Steam became the motive force of the Industrial Revolution as coal and iron ore were the raw materials.

瓦特发明的蒸汽机很快地施展了拳脚，把依赖水源的工业解放了出来。通过驱动高效率的泵，引擎可将矿井中的水排出，矿井就能挖掘得更深。煤的便利使用激发了威廉•默多克在 18 世纪 90 年代发明了 1 500 年以来首例夜间照明设备。。新世纪伊始，煤气灯在与冒烟的油灯和忽闪的蜡烛的比较中尽占优势，*经济富裕的*伦敦人也开始习惯了煤气作家用照明甚至街道照明。依赖于木炭供应的铁匠们急需燃料，他们也受益于*越来越多的*煤炭供应。*配备有蒸汽动力的鼓风炉使得越来越多的钢铁供应成为可能*。蒸汽成为了工业革命中的主要动力，当时的煤矿和铁矿成为了是工业的主要原材料。

By 1800 more than a thousand steam engines were in use in the British Isles, and Britain "retained" a virtual monopoly on steam engine production until the 1830s. Steam power did not merely spin cotton and roll iron; early in the new century, it also multiplied ten times over the amount of paper that a single worker could produce in a day. At the same time, operators of the first printing presses run by steam rather than by hand found it possible to produce a thousand pages in an hour rather than thirty. Steam also promised to eliminate a transportation problem not fully solved by either canal boats or turnpikes. Boats could carry heavy weights, but canals could not cross hilly terrain; turnpikes could cross the hills, but the roadbeds could not stand up under great weights. These problems needed still another solution, and the ingredients for it lay close at hand. In some industrial regions, heavily laden wagons, with flanged wheels, were being hauled by horses along metal rails; and the stationary steam engine was puffing in the factory and mine. Another generation passed before inventors succeeded in combining these ingredients, by putting the engine on wheels and the wheels on the rails, so as to provide a machine to take the place of the horse. Thus the railroad age sprang from what had already happened in the eighteenth century.

19 世纪时，英国已经拥有上千台蒸汽发动机，直到 19 世纪 30 年代以前，英国在蒸汽机的生

产方面一直处于实质性垄断地位。蒸汽机不仅可以用于织布、炼铁，19 世纪早期，蒸汽机的使用同样大大提高了造纸的效率，蒸汽动力生产的产量是一个工人一天产量的 10 倍。那时，第一个利用蒸汽发动的印刷机的印刷厂 1 小时就能完成 1 000 页的印量，而手动印刷机只能完成 30 页的工作量。。蒸汽动力还实现了运河及收费公路无法完全解决的运输问题。货船的确可以负荷重物，但人们无法利用运河在多山的区域实现运输，虽然利用公路可以穿实现在多山区域的运输，但路面的承载能力有限。这些问题都需要其他解决方法，解决问题所需要的条件其实唾手可得。在一些工业地区，四轮马车用于承载重物，它们配备有带凸的车轮，通过马力拉车在铁轨上行驶；静止的蒸汽发动机广泛运用于工厂和矿井之中。直到过了一代，另一批发明家们才将这些条件成功地组合在一起，给车轮配备上蒸汽动力，让轮子在铁路上运转，利用机器替代了原有的马。这就是铁路时代从 18 世纪既有条件发展起来的过程。

TPO 6 – 2 William Smith
威廉 • 史密斯

In 1769 in a little town in Oxfordshire, England, a child with the very ordinary name of William Smith was born into the poor family of a village blacksmith. He received rudimentary village schooling, but mostly he roamed his uncle's farm collecting the fossils that were so abundant in the rocks of the Cotswold hills. When he grew older, William Smith taught himself surveying from books he bought with his small savings, and at the age of eighteen he was apprenticed to a surveyor of the local parish. He then proceeded to teach himself geology, and when he was twenty-four, he went to work for the company that was excavating the Somerset Coal Canal in the south of England.

1769 年，在英国牛津郡的一个小镇上，一个小男孩儿出生在村里一户穷铁匠家，他的名字很普通，叫做威廉•史密斯。史密斯只在村里的学校接受了最基本的教育，大部分的时间都是在他叔叔的农场里搜寻化石，这些化石在科茨沃尔德山的岩石里是很常见的。长大后，他开始用微薄的积蓄买书自学测量，18 岁的时候，史密斯成为了当地教区测量员的助理。后来，他又自学了地质学，24 岁的时候，他开始为挖掘英格兰南部 Somerset Coal 运河的那家公司工作。

This was before the steam locomotive, and canal building was at its height. The companies building the canals to transport coal needed surveyors to help them find the coal deposits worth mining as well as to determine the best courses for the canals. This job gave Smith an opportunity to study the fresh rock outcrops created by the newly dug canal. He later worked on similar jobs across the length and breadth of England, all the while studying the newly revealed strata and collecting all the fossils he could find. Smith used mail coaches to travel as much as 10,000 miles per year. In 1815 he published the first modern geological map, "A Map of the Strata of England and Wales with a Part of Scotland," a map so meticulously researched that it can still be used today.

那是在蒸汽火车发明之前，运河建筑正处于顶峰时期。致力于开掘运河来运输煤的公司需要测量员帮助他们探寻值得挖掘的煤矿的地址以及最佳的运河路线。这份工作为史密斯提供了机会，使他能够接触和学习那些因为运河开掘而露出地面的新鲜岩层。后来他仍从事类似的工作，行遍全国，不断地研究那些新出现的地层，同时收集他所能发现的化石。史密斯乘着邮件马车每年行进将近 1 万英里。1815 年，他绘制了第一张现代地质学地图——《英格兰、威尔士及部分苏格兰地区地层地图》，这张地质地图绘制得非常精确，直到现在仍有参考价值。

In 1831 when Smith was finally recognized by the Geological Society of London as the "father of English geology," it was not only for his maps but also for something even more important. Ever since（从…时候起） people had begun to catalog the strata in particular outcrops, there had been the hope that these could somehow be used to calculate geological time. But as more and more accumulations of strata were cataloged in more and more places, it became clear that the sequences of rocks sometimes differed from region to region and that no rock type was ever going to become a reliable time marker throughout the world. Even without the

problem of regional differences, rocks present a difficulty as unique time markers. Quartz is quartz-a silicon ion surrounded by four oxygen ions-there`s no difference at all between two-million-year-old Pleistocene quartz and Cambrian quartz created over 500 million years ago.

1831 年，史密斯最终被伦敦地质学会认可，并赋予他“英国地质学之父”的称号，这不仅仅是因为那张地图，而且是为了其他更重要的原因。从人们开始对露出地面的特殊岩层进行分类的时候起，大家就开始认为这些岩石可能会以某种方式被用于计算地质年代。但是，随着各地越来越多的岩层的积累和分类，岩层顺序也因地区的不同而不同，因此，全世界没有一种特定的岩层能被认作是划分地质年代的标志。即便排除区域差异的影响，岩石作为确定年代的标记还是存在一些难题。石英就是石英---四个氧离子包围一个硅离子的化合物——而 200 万年前更新世的石英**和 5 亿年前寒世纪的石英并无差别**。

As he collected fossils from strata throughout England, Smith began to see that the fossils told a different story from the rocks. Particularly in the younger strata, the rocks were often so similar that he had trouble distinguishing the strata, but he never had trouble telling the fossils apart. **While rock between two consistent strata might in one place be *shale* and in another *sandstone*,** the fossils in that shale or sandstone were always the same. Some fossils endured through so many millions of years that they appear in many strata, but others occur only in a few strata, and a few species had their births and extinctions within one particular stratum. Fossils are **thus** identifying markers for particular periods in Earth's history.

史密斯在全英国的岩层中不断搜集化石，后来他发现化石所反映的史实和岩石反映的完全不同，尤其是那些新产生的地层里的岩石，这些岩石非常类似，不易于区分地层。而区分其中的化石对史密斯来说简直就是轻而易举。**在同一地层中发现的岩石可能在这片地层中属于*泥板岩*，而在另一片地层中可能是*砂岩***，而在那些泥板岩或者砂岩中的化石往往都是一样的。有的化石经历了数百年万之久，它们存在于很多岩层中，但有的化石只存在于部分地层，还有一部分生物的化石从出现至灭绝都只出现在一个特定的岩层中。因此，化石才是真正划分地球历史特定年代的指针。

Not only could Smith identify rock strata by the fossils they contained, he could also see a pattern emerging: certain fossils always appear in more ancient sediments, **while** others begin to be seen as the strata become more recent. By following the fossils, Smith was able to put all the strata of England's earth into relative temporal sequence. About the same time, Georges Cuvier made the same discovery while studying the rocks around Paris. Soon it was realized that this principle of faunal (animal) succession was valid not only in England or France but virtually everywhere. It was actually a principle of floral succession as well, because plants showed the same transformation through time ***as did*** fauna. Limestone may be found in the Cambrian or-300 million years later-in the Jurassic strata, but a trilobite-the ubiquitous marine arthropod that had its birth in the Cambrian-will never be found in Jurassic strata, ***nor*** a dinosaur in the Cambrian.

史密斯不仅可以通过岩石中包含的化石来识别地层，而且可以看出他们显露出来的模式：一些

特定的化石往往出现在更为久远的沉积物当中，而其他的化石则可以在距今年代较近*(随着年代更近)*的地层中发现。通过追踪化石，史密斯将英国范围内所有的地层进行了彼此出现时间的排序。同时，乔治•居维叶在研究巴黎周围的岩石时也得出了同样的发现。很快人们就开始认识到，这种动物物种的延续性是符合逻辑的，不仅仅是在英国、法国，而实际上在全世界范围都是适用的。事实上，这一原则同样适用于证实植物的延续性，因为植物和动物一样，它们的化石也显示了时间的推移。人类有可能在侏罗纪时期的地层中发现寒世纪或者 3 亿年后的石灰岩，但绝不可能在侏罗纪时期地层中发现三叶虫化石（三叶虫是寒世纪非常普遍的水生节肢动物），也不可能发现寒世纪时期的恐龙化石。

本段中，while 是考点！

TPO 6 – 3 Infantile Amnesia
婴幼儿失忆症

What do you remember about your life before you were three? Few people can remember anything that happened to them in their early years. Adults' memories of the next few years also tend to be scanty. Most people remember only a few events—usually ones that were meaningful and distinctive, such as being hospitalized or a sibling's birth.

三岁前生活中发生事情你还记得多少？很少有人能记得婴幼儿时期曾经发生在他们身上的事情。成年人对三岁之后那几年的记忆也很稀疏。大部分人只记得那些很少的特殊的事情，比如住院或者弟弟妹妹的出生。

How might this inability to recall early experiences be explained? The sheer passage of time does not account for it; adults have excellent recognition of pictures of people who attended high school with them 35 years earlier. Another seemingly plausible explanation-that infants do not form enduring memories at this point in development-also is incorrect. Children two and a half to three years old remember experiences that occurred in their first year, and eleven month olds remember some events a year later. **Nor does the hypothesis** that infantile amnesia reflects repression-*or holding back*-of sexually charged episodes **explain the phenomenon**. While such repression may occur, people cannot remember ordinary events from the infant and toddler periods either.

人们无法回忆起幼年事情的现象该如何解释呢？恐怕**时间的流逝**无法阐述清楚，成年人对 35 年前的高中同学照片仍可进行清楚地辨认。一种**看似合理的解释**认为，婴儿时期，孩子正在发展对发生的事情尚未形成永久性记忆，这种说法并不准确。两岁半到三岁的孩子能够记得他们一岁时候的事情，11 个月大的孩子一年以后仍会记得一些事情。**那些假设**婴幼儿健忘症反映了孩子们对~~充满性欲的插曲~~（性冲动）的压制和隐藏，**同样也解释不通**。这种压制发生的时候，人们连孩提时代最普通的事情都是无法回忆起来的。

Three other explanations seem more promising. One involves physiological changes relevant to memory. Maturation of the frontal lobes of the brain continues throughout early childhood, and this part of the brain may be critical for remembering particular episodes in ways that can be retrieved later. Demonstrations of infants' and toddlers' long-term memory have involved their repeating motor activities that they had seen or done earlier, such as reaching in the dark for objects, putting a bottle in a doll's mouth, or pulling apart two pieces of a toy. The brain's level of physiological maturation may support these types of memories, but not ones requiring explicit verbal descriptions.

除此之外的三种解释似乎更具说服力。一种观点涉及记忆相关的生理变化。孩子们早期的童年时代中，脑前叶不断地成熟，它对记忆发生的特殊事件以及之后对这些事情的回想起着至关重要的作用。婴幼儿长期记忆的形成，还会涉及到他们之前早期看到的或者自身经历的活动的重复，比如：到黑暗的环境里取东西，把瓶子塞到了洋娃娃的嘴里，或者将玩具撕成两半等。除

了那些需要清晰语言描述的事件之外，大脑生理成熟的程度足以帮助他们记得这些特殊事件。

A second explanation involves the influence of the social world on children's language use. Hearing and telling stories about events may help children store information in ways that will endure into later childhood and adulthood. Through hearing stories with a clear beginning, middle, and ending children may learn to extract the gist of events in ways that they will be able to describe many years later. Consistent with this view, parents and children increasingly engage in discussions of past events when children are about three years old. However, hearing such stories is not sufficient for younger children to form enduring memories. Telling such stories to two year olds does not seem to produce long-lasting verbalizable memories.

第二种观点与社会环境对孩子运用语言的影响有关。听故事和讲故事将有助于储存信息，直到他们的童年和成年。听故事的时候有个清晰的开头、情节和结尾会帮助孩子们提取事件的要点，并且使他们在过了很多年以后仍然可以描述这些事情。越来越多的家长们会在孩子三岁左右的时候和他们讨论过去发生的事情，这也与该理论一致。然而，仅仅听这些故事还是不足以帮更年幼的孩子形成永久的记忆。给两岁的孩子讲故事，并不能使他们形成语言化的记忆。

A third likely explanation for infantile amnesia involves incompatibilities between the ways in which infants encode information and the ways in which older children and adults retrieve it. **[*Whether* people can remember an event depends critically on the fit between the way in which they earlier encoded the information and the way in which they later attempt to retrieve it.]** The better able the person is to reconstruct the perspective from which the material was encoded, the more likely that recall will be successful.

第三种可能的解释认为婴幼儿健忘症与婴儿储存信息的方式和成年后进行回忆的方式不相容有关。 **【人们*是否*能够回忆起一件事情的关键在于这两种方式的匹配程度】**。 两种方式越匹配，越有助于人们成功回忆之前发生的事情。

This view is supported by a variety of factors that can create mismatches between very young children's encoding and older children's and adults' retrieval efforts. The world looks very different to a person whose head is only two or three feet above the ground than to one whose head is five or six feet above it. Older children and adults often try to retrieve the names of things they saw, but infants would not have encoded the information verbally. General knowledge of categories of events such as a birthday party or a visit to the doctor's office helps older individuals encode their experiences, but again, infants and toddlers are unlikely to encode many experiences within such knowledge structures.

事实上，很多因素会导致婴幼儿储存信息的方式和成年人进行回忆的方式不匹配。对于一个头离地面两三尺的孩子来说，这个世界与那些稍大点的孩子眼中的世界不尽相同。长大后的孩子和成人经常试图回忆那些他们曾经见过的事物的名字，但在他们的幼儿时期时尚未对此进行语言化的信息储存。人们对类似生日聚会或者拜访医生诊所类似事件的分类常识有助于人们记忆他们的经历，但是，婴幼儿时期的孩子们似乎缺乏这些知识结构来帮助他们储存信息。

These three explanations of infantile amnesia are not **mutually exclusive**; indeed, they support each other. Physiological immaturity may be part of why infants and toddlers do not form extremely enduring memories, even when they hear stories that promote such remembering in preschoolers. Hearing the stories may lead preschoolers to encode aspects of events that allow them to form memories they can access as adults. Conversely, improved encoding of what they hear may help them better understand and remember stories and thus make the stories more useful for remembering future events. Thus, all three explanations-physiological maturation, hearing and producing stories about past events, and improved encoding of key aspects of events-seem likely to be involved in overcoming infantile amnesia.

以上三种关于幼儿期遗忘的解释实际上并非互斥，他们是相互支持的。学龄前孩子听到那些可以促进他们回忆的故事时，生理上的不成熟是导致他们无法形成长久记忆的原因之一。听那些故事将有助于学龄前孩子在脑中储存已经发生的事情，以便形成他们可以像成年人那样自由提取的记忆。相反，将他们听到的故事进行更进一步的编码将有助于他们更好地理解和记忆，因此，那些故事将对他们记住将来发生的事情更有帮助。综上所述，生理上的成熟、听故事和讲故事以及改进对事件关键信息的编码都有助于克服婴幼儿遗忘症。