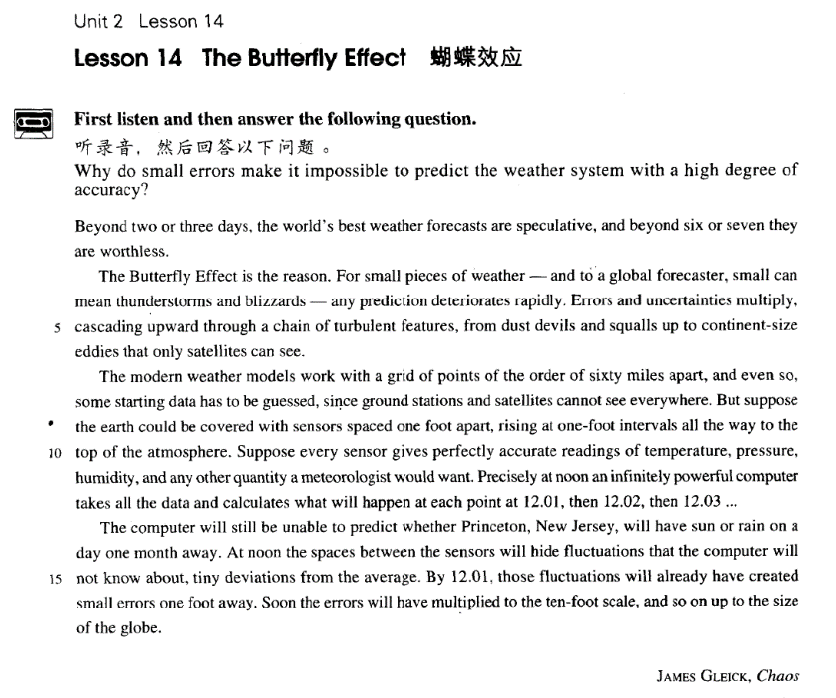
Book



课文

Beyond two or three days, the world's best weather forecasts are speculative, and beyond six or seven they are worthless.

世界上最好的两三天以上的天气预报具有很强的猜测性，如果超过六七天，天气预报就没有了任何价值。

The Butterfly Effect is the reason.

原因是蝴蝶效应。

For small pieces of weather -- and to a global forecaster, small can mean thunderstorms and blizzards -- any prediction deteriorates rapidly.

对于小片的恶劣天气 -- 对一个全球性的气象预报员来说，“小”可以意味着雷暴雨和暴风雪 -- 任何预测的质量会很快下降。

Errors and uncertainties multiply, cascading upward through a chain of turbulent features, from dust devils and squalls up to continent-size eddies that only satellites can see.

错误和不可靠性上升，接踵而来的是一系列湍流的徵状，从小尘暴和暴风发展到只有卫星上可以看到的席卷整块大陆的旋涡。

The modern weather models work with a grid of points of the order of 60 miles apart, and even so, some starting data has to be guessed, since ground stations and satellites cannot see everywhere.

现代气象模型以一个坐标图来显示，图中每个点大约是间隔60英里，既使是这样，有些开始时的资料也不得不依靠推测，因为地面工作站和卫星不可能看到地球上的每一个地方。

But suppose the earth could be covered with sensors spaced one foot apart, rising at one-foot intervals all the way to the top of the atmosphere.

假设地球上可以布满传感器，每个相隔1英尺，并按1英尺的间隔从地面一直排列到大气层的顶端。

Suppose every sensor gives perfectly accurate readings of temperature, pressure, humidity, and any other quantity a meteorologist would want.

再假定每个传感器都极极端准确地读出了温度、气压、温度和气象学家需要的任何其他数据。

Precisely at noon an infinitely powerful computer takes all the data and calculates what will happen at each point at 12.01, then 12.02, then 12.03...

在正午时分，一个功能巨大的计算机搜集了所有的资料，并算出在每一个点上12：01、12：02、12：03时可能出现的情况。

The computer will still be unable to predict whether Princeton, New Jersey, will have sun or rain on a day one month away.

计算机无法推断出1个月以后的某一天，新泽西州的普林斯顿究竟是晴天还是雨天。

At noon the spaces between the sensors will hide fluctuations that the computer will not know about, tiny deviations from the average.

正午时分，传感器之间的距离会掩盖计算机无法知道的波动、任何偏平均值的变化。

By 12.01, those fluctuations will already have created small errors one foot away.

到12：01时，那些波动就已经会在1英尺远的地方造成偏差。

Soon the errors will have multiplied to the ten-foot scale, and so on up to the size of the globe.

很快这种偏差会增加到尺10英的范围，如此等等，一直到全球的范围。

词汇讲解

* **template** [pʌŋktʃʊ'ælətɪ]
* **template** show.

### forecast

* **forecast** ['fɔ:kɑ:st] ['fɔ:rkæst] n. & v. 预测，预报

**forecast** v. & n. **英文解释：**to publicly say what will happen in the future with the weather or the economic or political situation, esp. when you have special or technical knowledge

* weather **forecast**
* the company’s annual sales **forecast**
* Rain has been **forecast** for tomorrow.
* The Federal Reserve Bank **forecasts** the economy will grow 8% this year.

**【扩展】**

**foretell**（预言；预兆、预示） / **predict** （只能表示“预言“）……

* Precautions of this sort are necessary, for it is impossible to **foretell** （预言）the exact nature of the difficulties which will confront the pot-holer.
* Considering how recent these developments are, it is even more remarkable that as long ago as the 1960s, an Englishman, Leon Bagrit, was able to **predict** （预言）some of the uses of computers which we know today.
* Timely snow **foretells** （预兆、预示）a bumper harvest.

**forebode** v. 预示；预感；预兆 （强调不愉快的事）

* Black clouds **forebode** a storm.

**prophesy** （强调超自然能力）vt. 预言；预告；vi. 预言；预报；传教

* Jesus **prophesied** that one of his disciples would betray him.

### speculative

* **speculative** ['spekjələtɪv] adj. 推测的；投机的

**speculative** adj. **英文解释：**based on guessing, not on information or facts

* His conclusions are **purely** （推测的）speculative.
* **speculative**（投机的） investments

**【同根词】**

**speculate** v. **含义1：**猜测

* We can only **speculate *on***the reasons for his sudden resignation.

**speculate** v. **含义2：**to buy goods, property, shares etc., hoping that you will make a large profit when you sell them 投机

* **speculate *in*** stocks

**speculation** n. 投机；推测；思索；投机买卖

* property **speculation**

**【近义词】**表达“推测”：

**conjecture**

**guesswork** / **guess work**

### blizzard

* **blizzard** ['blɪzəd] n. 特大暴风雪

**blizzard** n. **英文解释：**severe snowstorm thunderstorm

**【****扩展】**表达**“极端天气”**：

**snowstorm** n. 暴风雪；雪暴

**windstorm** n. 暴风

**sandstorm** n. [气象] 沙暴；大风沙

**squall** n. 暴风；vt. 起风暴

**dust devil** n. 尘卷风

**cyclone** n. 旋风；[气象] 气旋；飓风

**hurricane** n. 飓风，暴风

**typhoon** n. [气象] 台风

**tornado** n. [气象] 龙卷风；旋风；暴风；大雷雨

### deteriorate

* **deteriorate** [dɪ'tɪəriəreɪt] v. 变糟，恶化
* Alan’s health has **deteriorated**.
* America’s **deteriorating** economy

**deteriorate into …** 恶化成了…

* The discussion **deteriorated into** a bitter quarrel.

**【近义词组】**表达“**变糟，恶化**”：

**degenerate** n. 堕落；vt. 使退化；恶化

* Our relationship has **degenerated** over the years.

**degenerate into …** 恶化成了…

* Don’t allow your comments **degenerated into** a personal attack.

**worsen** v. 变糟，恶化

* The weather **worsened** during the night.

**get worse** v. 变坏

**go from bad to worse**  每况愈下；越来越糟；江河日下

**go downhill** （质量、健康等）每况愈下，走下坡路，恶化

* Moving in together was a mistake, and our relationship rapidly **went downhill**.

### turbulent

* **turbulent** ['tɜ:bjələnt] adj. 汹涌而不稳定的；动荡的

**turbulent** adj. **英文解释：** air or water moving violently and unevenly

* **turbulent** waves
* the **turbulent** times of the French Revolution

**【同根词】**

**turbulence** n. 骚乱，动荡；[流] 湍流；狂暴

* political turbulence social **turbulence**

**【词根】**

“**turb**” = disturb 搅乱

**turbid** adj. 浑浊的；混乱的；雾重的

**turbine** n. [动力] 涡轮；[动力] 涡轮机

**perturb** vt. 扰乱；使…混乱；使…心绪不宁

* Mother was **perturbed** by my illness.

**imperturbable** adj. 冷静的；泰然自若的

### humidity

* **humidity** [hju:'mɪdəti] n. 湿度

**【同根词】**

**humid** ***adj.*** 潮湿的；湿润的；多湿气的 （只能指空气）

* **humid** air / atmosphere
* **humid** summer nights

**【近义词】【辨析】**表达“湿的”：

**wet** 湿（内部、外部）

* Her hands were **wet**.
* a **wet** sponge

**moist** （褒义）潮湿的

**damp** （贬义）潮湿的

* Bring me a **moist** towel.
* a cold, **damp** collar

### meteorologist

* **meteorologist** [7mi:tiə'rɒlədʒɪst] n. 气象学家

**meteorologist** n. 气象学家

**meteorology** n. 气象状态，气象学

**【词根】**

“**meteor**”= shooting / falling star n. 流星；[气象] 大气现象

* **meteor** shower
* **meteor** swarm
* **meteorite**
* asteroid 小行星

### deviation

* **deviation** [7di:vi'eɪʃn] n. 偏差，偏离常规

**deviation** n. **英文解释：**a difference from what is expected or acceptable

* Left **deviation**
* Right **deviation**
* sexual **deviation**

**deviation from** 偏离…

* Any **deviation from** the party's faith is seen as betrayal.
* At noon the spaces between the sensors will hide fluctuations that the computer will not know about, tiny **deviations from** the average.

**【同根词】**

**deviate from** 偏离…

* **deviate from one’**s plan / principles

**deviant** n. 不正常者；偏移值；变异物 adj. 不正常的；离经叛道的

* a sexual **deviant**

**【词根】**

“**de**” =**away from**

+ “**vi(a)**”=道路

+ **ate**（动词字根）

**via** prep. 渠道，通过；经由

* go from London to Washington **via** New York

**viable** adj. 可行的；能养活的；能生育的

* a **viable** proposal
* economically **viable**

**obviate** vt. 排除；避免；消除

* The new treatment **obviates** the need for surgery.

课文讲解

# （标题）

# The Butterfly Effect

知识点（1）

**butterfly** n. 蝴蝶；蝶泳；举止轻浮的人；追求享乐的人

* a social **butterfly**

**have butterflies (in one’s stomach)** 忐忑不安

* It was the morning of the World Cup Final and most of the players **had butterflies (in their stomach)**.

知识点（2）课文背景介绍

**chaos theory** n. 混沌理论

Small changes in initial conditions can lead to large-scale and unpredictable variation in the future state of the system.

A frequent metaphor for one aspect of chaos theory is the **Butterfly Effect**: butterflies flapping their wings in the Amazon affect the weather in Chicago.

# （第一段）

# Beyond two or three days, the world's best weather forecasts are speculative, and beyond six or seven they are worthless.

知识点（1）

Beyond two or three days 超过了两三天

**beyond** prep.

**课文写法替换：**

**after …**;

**later than …**

**Exceeding** two or three days, …

知识点（2）

… the world's best weather forecasts **are speculative** …

* **课文写法替换：**：
* … **are based on speculation / conjecture**.
* … **are based on guesswork / guess work**.

知识点（3）

… they are **worthless**.

* **课文写法替换：**表达**“没有价值的”**
* … they are **valueless**
* … they are **useless**
* … they are **of no earthly use**.
* … they are **totally useless**.

# （第二段）

# The Butterfly Effect is the reason.

知识点（1）

**reason for / behind** 背后的原因

* The Butterfly Effect is the reason **for / behind it**.

知识点（2）

* **课文写法替换：**表达**“是…的原因”**
* The Butterfly Effect **accounts for it**.
* The Butterfly Effect **underlies it**.
* The reason **is the** Butterfly Effect.
* The reason **lies in** the Butterfly Effect.
* The reason is because of the Butterfly Effect. **X错误表达，reason和because重复**

# For small pieces of weather -- and to a global forecaster, small can mean thunderstorms and blizzards -- any prediction deteriorates rapidly.

**语法分析：**

For small pieces of weather（介词短语做状语） — and to a global forecaster（介词短语做状语）, small can mean thunderstorms and blizzards（插入语） — any prediction deteriorates rapidly.

知识点（1）

**mean** v. **英文解释：**be likely to result in … 导致、意味着…

* The merger will **mean** the eventual closure of the company’s Shanghai Office.

知识点（2）

**deteriorate** vi. 恶化，变坏 ; vt. 恶化

* **课文写法替换：**表达**“恶化，变坏”**
* … any prediction **gets worse** / **degenerates** / **becomes inaccurate** rapidly.

# Errors and uncertainties multiply, cascading upward through a chain of turbulent features, from dust devils and squalls up to continent-size eddies that only satellites can see.

**语法分析：**

Errors and uncertainties multiply, **cascading** upward through a chain of turbulent features, *from*（***from*** …*介词短语当后置定语*） *dust devils and squalls up to continent-size eddies that only satellites can see*. （**cascading …** 非谓语动词做状语，修饰multiply）

知识点（1）

**multiply** v. **英文解释：**to increase by a large amount or number, or to make sth. do this （使）大幅增加

* Within the last 10 years, both sales and profits have **multiplied**.
* Smoking **multiplies** the risk of heart attacks.

**【近义词】**表达**“大幅增加”**：

**snowball**

* Unemployment **snowballed** at the beginning of 1980s.

**proliferate**

* Small businesses have **proliferated** in the last ten years.

**mushroom**

* Trade between the two countries has **mushroomed**.

**explode**

* China’s population **exploded** after 1949.
* population **explosion**

知识点（2）

**【近义词组】**表达**“一连串的”**：

**a chain of …**

**a series of …**

**a train of …**

**a string of …**

**a succession of …**

**a progression of …**

知识点（3）

**feature** n. **characteristic** 特征

知识点（4）

**from A to B** 从A到B

**from A up to B** 从A一直到到B

# （第三段）

# The modern weather models work with a grid of points of the order of 60 miles apart, and even so, some starting data has to be guessed, since ground stations and satellites cannot see everywhere.

**语法分析：**

The modern weather models work with a grid of points *of the order of 60 miles apart（介词短语当后置定语）*, and even so, some starting data has to be guessed, since(因为) ground stations and satellites cannot see everywhere（原因状语从句）.

知识点（1）

**work** v. **英文解释：**(of a machine, device, etc) function; operate （指机器、设备等）运作，运转

* This machine **works** by electricity.
* The delete key doesn't **work**.

知识点（1）

**grid** n. **英文解释：**a pattern of straight lines that cross each other to form squares （地图上的）坐标方格

* streets laid out on a **grid** pattern

知识点（3）

**of / in / on the order of** … = **approximately** 大约、大概

* The house cost him something **on / in / of the order of** $200,000.
* The house cost him something **in the neighborhood / vicinity of** $200,000.
* The house cost him **approximately** $200,000.

知识点（4）

**starting** adj. **beginning** 最初的

**【近义词】**表达**“最初的”**：

**initial** adj. 最初的；字首的

* at the **initial** stage / phase

**incipient** adj. 初期的；初始的；起初的；发端的

* **incipient** tumor
* the **incipient** light of day

**opening** adj. 开始的；开篇的；开头的

* his **opening** remarks
* the **opening** scene of the movie

**preliminary** adj. 预备性的；初步的；开始的

* a **preliminary** exam / contest

# But suppose the earth could be covered with sensors spaced one foot apart, rising at one-foot intervals all the way to the top of the atmosphere.

**语法分析：**

But **suppose（祈使句）** （省略that，宾语从句）the earth could（虚拟语气） be covered with sensors spaced one foot apart（后置定语）, ***rising*** *at one-foot intervals all the way to the top of the atmosphere（all the way to…介词短语做状语）*. **（*rising*... 方式状语）**

知识点（1）

**space** v. 将……均匀隔开

* **Space** your workouts two days apart to avoid sore muscles.
* Bean plants should be **spaced** three inches apart.

知识点（2）

**interval** n. **含义1：**（两事件中的）间隔时间

* …, and by measuring the time **interval** between the taps and the receipt of the echoes the depth of the sea at that point can be calculated.

**interval** n. **含义2：**（物体之间的）间隔空间

* They planted trees in the **intervals** between the houses.

知识点（3）

**all the way** 一 直 ……

* He ran **all the way** home.
* Eventually the turtle has been butted **all the way** down to the floor of the tank.

# Suppose every sensor gives perfectly accurate readings of temperature, pressure, humidity, and any other quantity a meteorologist would want.

**语法分析：**

**suppose（祈使句）**（省略that，宾语从句）every sensor gives perfectly accurate readings of temperature, pressure, humidity, and any other quantity a meteorologist would want（定语从句）.

知识点（1）

**reading** 读数

* take the meter **reading** 查表
* **read** the meter 查表

# Precisely at noon an infinitely powerful computer takes all the data and calculates what will happen at each point at 12.01, then 12.02, then 12.03...

**语法分析：**

**看作省略了suppose that的祈使句：**

*Precisely at noon**（时间状语）* an infinitely powerful computer takes all the data and calculates what will happen at each point（地点状语） *at 12.01, then 12.02, then* *12.03... （时间状语）* （what… 宾语从句）

知识点（1）

Precisely at noon 正午时分

= **at high noon**

= **at 12 o’clock sharp**

= **at punctually 12 o’clock**

知识点（2）

**infinite** adj. 无限的，无穷的；无数的；极大的

* The universe is **infinite**.

**【反义词】**

**finite** adj. 有限的；限定的

* Human knowledge is **finite**.

**【形近词】**

**infinitive** adj. 原形的，不定式的

**definite** adj. 一定的；确切的

**indefinite** adj. 不确定的；无限的；模糊的

* an **indefinite** answer

**definitive**

* a **definitive** verdict

知识点（2）

**calculate** v. 计算

**【近义词组】**表达**“计算”**：

**work out**

**figure out**

**compute**

**reckon**

* The inflation is **reckoned** to be 10%.

# （第四段）

# The computer will still be unable to predict whether Princeton, New Jersey, will have sun or rain on a day one month away.

# At noon the spaces between the sensors will hide fluctuations that the computer will not know about, tiny deviations from the average.

**语法分析：**

At noon （时间状语）the spaces between the sensors（后置定语） will hide fluctuations that the computer will not know about（that ...定语从句，修饰fluctuations）, *tiny deviations from the average**（fluctuations的同位语）*.

# By 12.01, those fluctuations will already have created small errors one foot away.

# Soon the errors will have multiplied to the ten-foot scale, and so on up to the size of the globe.

知识点（1）

multiplied “大幅增加”

**【近义词】**表达**“大幅增加”**：同义替换

* … will have **snowballed** to …
* … will have **proliferated** to …
* … will have **rocketed** to …
* … will have **soared** to …

知识点（2）

**scale** 程度、规模、范围

* on a small **scale** 小规模
* on a limited **scale** 有限规模
* on **a large / grand** **scale** 大规模
* on **a / an colossal / enormous / gigantic** **scale** 特大规模
* on **a national / nationwide** **scale** 全国规模
* on **a / an global / international / world / worldwide** **scale** 全世界规模

知识点（3）

**and so on** 等等

**【近义词组】**表达**“等等”**：

**and so forth**

**etc. (et cetera)**

**and the like**

**and what not**

知识点（3）

global size 全世界规模

global scale 全世界规模

international / world / worldwide scale 全世界规模