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4-13 The search for oil

The deepest holes of all are made for oil, and they go down to as much as 25,0000 feet英尺.

But we do not need to send men down 目的状to get the oil out, 方式状as we must [with other mineral矿物的 deposits沉淀物，存款].

The holes are only borings（n.）钻孔, less than a foot in diameter直径，直径长. （直径不到1英尺）

My particular experience is largely in oil, and the search for oil has done more [to improve **deep drilling**深孔钻探] than比……做得更多 any other mining（n.）采矿（业） activity.

When it has been decided where we are going to drill, we put up竖起at the surface an oil derrick井架.

It has to必须 be tall / because it is like a giant **block and tackle**滑轮组，滑车设备, and we have to lower（缓慢地）降下，放下 into the ground / and haul拖，拉 out of the ground 宾great lengths of **drill pipe**钻杆 （which are rotated使转动 by an engine at the top / and are fitted with装配着 a **cutting bit**钻头 at the bottom）.

The geologist地质学家 needs to know what rocks （the drill has reached）, so [**every so often**时常] a sample is obtained 方式状with a **coring bit**取芯钻头. It cuts a clean（形状）规则的，边缘平滑的 cylinder圆柱体 of rock, [from which] can be seen the strata岩层（the drill has been cutting through）.

Once we get down to达到 the oil, it usually flows to the surface / because great pressure, **either** from gas **or** water, is pushing it.

This pressure must be under control, and we control it **by means of**以…方式，靠…手段 the mud which we circulate注入，（使）循环 down the drill pipe.

We endeavour尽力，竭力 to avoid the old, romantic idea of a gusher喷油井, which wastes oil and gas. We want it 宾补to stay down the hole until we can lead it off让…流出 in a controlled manner.

1. as much as 多达、达到
2. tackle ['tæ-kl] n. （吊拉物体用的）索具，滑轮组。用具，装备
3. pipe n.管子，管道
4. every so often作频率状语，表示“时常”之意，

类似的频率状语还有：  
every now and again、  
every now and then、  
every once in a while、  
now and again 等

1. core n. (物体、建筑物或城市的)中心部分
2. get down to ①达到，②认真对待、致力于

It’s no good {shirking the job}；it will have to be got down to. 推卸这份工作是没有用的，你得认真去干。（shirk [ʃɜ:k] vt.& vi. 逃避（工作），偷懒）

1. endeavour to do sth. 你设法/尽力去做某事

4-14 The Butterfly Effect

Beyond two or three days, the world's best weather forecasts （n.）预报，预测 are speculative（adj.）推测的, and [beyond six or seven days] they are worthless无价值的. The Butterfly Effect is the reason.

对于For small pieces of weather —— 插入and to a global forecaster预报员, small can mean thunderstorms大雷雨 and blizzards —— any prediction预测 deteriorates变坏，恶化 rapidly.

Errors and uncertainties multiply大量地增加，做乘法, 方式状cascading瀑布似地落下，倾泻而下 upward向上地 through **a chain of**一连串的,一系列的 turbulent湍流的,动荡的 features特征；特点, from **dust devils**尘旋风 and squalls暴风up to continent-size eddies（n.）漩涡 that only satellites人造卫星 can see.

The modern weather models work起作用 方式状with **a grid格子 of** points of the order（n.）顺序；次序 of sixty miles apart相隔，相距, and **even so**即便如此, some starting data has to be guessed, 原因状从since **ground stations**地面工作站 and satellites cannot see everywhere.

But suppose the earth **could**虚拟 be covered with sensors传感器 spaced以一定间隔排列 one foot apart, 方式状rising at one-foot intervals（n.）间隔,区间 all the way一路上，一直 to the top of the atmosphere.

Suppose every sensor gives perfectly accurate（adj.）精确的 readings of temperature, pressure, humidity湿度, and any other quantity （a meteorologist气象学家 **would** want）.

[Precisely at noon] an infinitely powerful computer takes all the data / and calculates what will happen at each point at 12.01, then 1202, then 12.03...

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

[At noon] the spaces between the sensors will hide fluctuations（n.）起伏，波动 that the computer will not know about, 同位语tiny deviations（n.）偏差 from the average. （任何偏平均值的变化。）

[By 12.01], those fluctuations起伏 will already have created small errors （one foot away）. （在1英尺远的地方造成偏差。） Soon the errors will have multiplied to the ten-foot scale规模,程度, **and so on**等等；诸如此类；依此类推 up to the size of the globe.

1. devil ['de-vl] n.撒旦，魔鬼；恶魔。淘气鬼；冒失鬼。