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## NASA Kelly twins study shows harsh effects of space flight and a brutal return to Earth

美国航空航天局凯利双胞胎研究显示，太空飞行和直接返回地球（会对人体）产生严重影响

Astronaut Scott Kelly made himself a guinea pig for all the people who dream of human journeys to Mars and other destinations in space. In 2015, Kelly rode a rocket into space and spent nearly a year on the International Space Station in low Earth orbit, while his identical twin brother, Mark Kelly, stayed on Earth's surface for NASA's celebrated "twins study," designed to see what spaceflight does to the human body.

为了所有那些梦想前往火星或者太空中的其它目的地的人，宇航员斯科特·凯利把自己变成了试验品。2015年，凯利乘坐火箭前往太空，并在近地轨道上的国际空间站待了近一年。与此同时，为了进行美国航空航天局著名的“双胞胎研究”，他的孪生兄弟，马克·凯利，留在了地球表面。该研究旨在了解太空飞行对人体的影响。

The full results, published Thursday in the journal Science, showed that Scott Kelly

experienced numerous physiological and chromosomal changes during his long sojourn in orbit, including changes in gene expression. His immune system went on high alert, both when he went to space and upon returning to Earth. His body acted as if it were under attack.

周四发布在《科学》期刊上的完整结果显示，斯科特·凯利在（近地）轨道长期逗留期间，经历了许多生理上的和染色体上的变化，其中包括基因表达上的变化。在他去往太空和回到地球后，他的免疫系统都处于高度戒备状态。他的身体好像是在遭受到攻击一样。

One of the most dramatic findings concerned epigenetics – how genes are turned on or off to produce proteins. Gene expression changed in both Kellys during the study but in significantly different ways. The study found that more than 90 percent of Scott Kelly's gene expression changes reverted to normal when he returned to the surface.

最引人注目的结果之一和表观遗传学有关，表观遗传学展示了基因是如何被表达或被阻遏以产生蛋白质的。在研究期间，凯利两兄弟体内的基因表达都发生了变化，但是方式大相径庭。研究显示，当斯科特回到地面时，他体内超过 90% 的基因表达变化恢复到了正常状态。

His telomeres lengthened in space. But that's no fountain of youth, the study found, because the telomeres shortened dramatically when he returned to Earth.

他的（染色体）端粒在太空中变长了。但是研究发现，这并没有使他重获年轻，因为当他返回地球时，端粒又急剧缩短了。

Months later, he still showed a slightly elevated number of cells with shortened telomeres, possibly an effect of radiation exposure. "He might be at some increased risk for cardiovascular disease or some types of cancer," said Susan Bailey, a biologist at Colorado State University who led one of the investigations in the study.

几个月后，斯科特·凯利体内的端粒变短的细胞数量依旧稍有增加，这可能是因为（他）暴露在了辐射下。科罗拉多州立大学的生物学家苏珊·贝利领导了该研究中一个项目，她表示：“他患有心血管疾病或某些癌症的风险可能会有所增加。”

— Washington Post: NASA Kelly twins study shows harsh effects of space flight and a brutal return to Earth

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### 重点词汇

**harsh**/hɑːrʃ/

adj. 刺激的；严重的；令人不快的

搭配短语：harsh lighting (adj. 过于强烈、刺激的)

英文释义：severe, cruel or unkind

搭配短语：harsh criticism

搭配短语：harsh words

**brutal**/'bru:tɪl/

adj. 残忍的；直截了当的

搭配短语：a brutal murder

英文释义：disagreeably direct and precise

例句：She spoke to me with brutal honesty, "I don't want to see you again!"

guinea pig

豚鼠；实验对象，供做实验的人

英文释义：a person used in experiments

例句：They're asking for students to be guinea pigs for the new teaching methods.

**orbit**/'ɔ:rbit/

n. (天体围绕行星或恒星运行的) 轨道

搭配短语：the earth's orbit around the sun

**identical**/aɪ'dentɪkl/

adj. 完全相同的；极为相似的

英文释义：exactly the same, or very similar

例句：He's got three identical T-shirts.

**physiological**/fɪziə'lɔ:dʒɪkl/

adj. 生理学的

相关词汇：physiology (n. 生理学)

搭配短语：physiological reactions

**chromosomal**/kroʊmə'soʊməl/

adj. 染色体的

相关词汇：chromosome (n. 染色体)

例句：Humans have 23 pairs of chromosomes in their cells.

搭配短语：chromosomal abnormalities

**sojourn**/'soʊdʒɜ:n/

n. 逗留，停留

英文释义：a period when a person stays in a particular place

搭配短语：a week's sojourn in Paris

**go on high alert**

高度戒备，高度警戒

相关词汇：alert (n. 警戒，戒备)

相关短语：put/be on high alert

例句：With the war looming, the troops went on high alert.

**epigenetics**/epɪdʒə'netɪks/

n. 表观遗传学

词根词缀：epi- (在...之上)

词根词缀：-tics (一般指某个科学学科)

相关词汇：genetics (n. 遗传学)

**revert to**

回到，恢复

英文释义：go back to sth.

例句：After her divorce she reverted to her maiden name.

**telomere**/'teləməɪr/

n. 端粒

英文释义：a compound structure at the end of a chromosome

**lengthen**/'lenθən/

v. 延长，拉长，加长，变长

相关词汇：length (n. 长度)

英文释义：get longer

反义词：shorten (v. 变短)

例句：The days lengthened as summer approached.

**elevated**/'elɪveɪtɪd/

adj. 提高的，升高的

相关词汇：elevate (v. 升高，提高)

相关词汇：elevator (n. 升降电梯)

近义词：raised

搭配短语：keep my feet elevated

**exposure**/ɪk'spoʊʒər/

n. 接触；面临；遭受

相关词汇：expose (v. 暴露，接触)

例句：You should limit your exposure to the sun.

**cardiovascular**/'kɑ:rdioʊ'væskjələr/

adj. 心血管的

相关词汇：cardio (n. 有氧运动)

词根词缀：cardio- (跟心脏有关的)

相关词汇：vascular (adj. 血管的)