Issue

I firmly believe that investing in space exploration is a waste of resources. Instead, we

should allocate these resources to address more pressing and realistic problems here on Earth.

To begin with, space exploration faces numerous significant challenges. From a

technological standpoint, we lack effective radiation protection, reliable closed-loop life support systems, and efficient methods for landing on other celestial bodies, among other advancements. Physically, humans are not yet capable of enduring prolonged periods in space without severe consequences. The stress experienced during space missions, as well as the difficulties of readjusting to normal life upon return, pose serious problems that remain unsolved.

Moreover, there are countless urgent issues on Earth that demand our attention and

sustained efforts. For instance, the global economy is deteriorating in this ever-changing world, leaving many nations struggling. Some regions are plagued by wars and extreme poverty. Additionally, poor international collaboration has exacerbated the climate crisis, putting our planet in greater peril. Without concentrated and continuous effort, how can we hope to address these pressing challenges? And if we cannot resolve these problems, how can we justify diverting resources to explore space, which demands immense investments?

Furthermore, even if humanity were to reach another planet, we are likely to repeat the same mistakes if we fail to address the problems currently afflicting Earth. If we cannot cherish and care for the planet we already have, no number of new planets will save us. Instead of solving our existing issues, we risk creating chaos wherever we go. Ignoring these pressing concerns to focus on exploring other worlds is, in my opinion, both shortsighted and unproductive.

In conclusion, we should stop investing disproportionately in space exploration and prioritize addressing the critical issues facing our planet today. It is only by protecting and improving life on Earth that we can hope to create a sustainable future for humanity.

Diagram Description

The diagram illustrates the hunger-satiety circuit within the brain, detailing the intricate interactions among various brain regions and hormones that regulate appetite and satiety.

Hunger and satiety hormones, such as leptin, which is released by fat cells in proportion to fat stores, and ghrelin, which is released by empty gut, influence the arcuate nucleus (ARC) in the hypothalamus. The ARC integrates circulating nutrients like glucose and hormones like leptin and insulin. These inputs covey vital information about the current state of the body, such as energy stores and nutrient availability. Specifically, leptin excites satiety-producing neurons, while hunger-producing neurons inhibits it. Leptin inhibits hunger-producing neurons, while ghrelin excites it.

The paraventricular hypothalamic nucleus (PVH) in the hypothalamus plays a pivotal role in metabolism and other autonomic functions. Within the PVH, melanocortin neurons serve as a critical component. Satiety-producing neurons excites the receptor of melanocortin neurons, while hunger-producing neurons inhibits it. The reason why melanocortin neurons is called the satiety switch is that its high activity causes satiety while its low activity causes hunger.

Nestled in the brainstem, the parabrachial nucleus (PBN) serves as a crucial relay station to higher-order brain areas and receives digestive input from the gut. Melanocortin neurons excites “Holy Grail” neurons which is a general term for the neurons connected to appetite among tens of thousands of unmapped neurons.

“Holy Grail” neurons transmit the information to subcortical structures which are involved in emotion and reward, facilitating the eventual transmission of this information to the cortex through direct and indirect projections.

Ultimately, the cortex receives the information and issues instructions for conscious, action-oriented activity.

Summary

The resurgence of chipmaking in Silicon Valley is being driven by the rapid rise of artificial AI and the growing demand for computational power. Rooted in the early innovations of semiconductors, such as transistors and integrated circuits, the chip industry has revolutionized modern computing. However, the exponential growth predicted by Moore’s and Dennard’s laws has encountered physical and technological limits, necessitating innovative approaches to sustain performance improvements and meet increasing demands.

At the heart of chipmaking are transistors, whose logic gates play an essential role in computation. According to Moore’s and Dennard’s laws, smaller transistors not only reduce unit costs but also improve performance. Yet, the industry faces a “power wall,” where leakage currents impose limitations on the speed and efficiency of smaller transistors. To overcome this barrier, researchers are exploring alternatives, including abandoning traditional transistor structures and adopting new materials for chip fabrication.

As chips become smaller and more intricate, packaging has emerged as a critical technology for enhancing energy efficiency and computing power. Innovations such as placing power lines below transistors or packaging smaller chiplets together have pushed design and engineering boundaries. Additional technologies, such as organic components, 3D packaging, and light cables, aim to further increase efficiency. The ultimate goal is to create layered chips, akin to skyscrapers, capable of maximizing performance while minimizing energy consumption. These advances in packaging and materials are pivotal in meeting the computational demands of AI technologies.

The training of AI models, particularly large-scale neural networks, has highlighted the need for powerful and efficient chips. Traditional CPUs are often inefficient, as significant time is wasted shuttling data between cores and memory during matrix multiplication—the core operation in deep learning. GPUs, originally designed for image processing, have proven superior due to their ability to parallelize thousands of cores. Building on this concept, specialized chips like TPUs (Tensor Processing Units) have been developed explicitly for deep learning tasks. Companies are also exploring solutions such as 16-bit data usage and algorithmic optimization to further enhance efficiency. This trend toward custom chips for AI tasks underscores the growing intersection of hardware and software development.

Traditional computing methods are increasingly energy-intensive, particularly for AI applications. This has led to the emergence of alternative designs inspired by the structure of the human brain. Analog computing, which activates memory only when high current or voltage is needed, significantly reduces energy consumption and speeds up processing. Optical computing, based on Mach-Zehnder Interferometers (MZIs), offers promising capabilities for running neural networks efficiently. While these technologies still require integration with digital systems, their potential to dominate in an AI-driven era, where speed often outweighs precision, is becoming evident.

Over the past five decades, the chipmaking industry has achieved remarkable progress under Moore’s law. However, as the law reaches its physical limits, the industry is adapting to sustain exponential gains in performance. The decline of traditional CPUs and the rise of specialized chips designed for specific software tasks mark a significant shift. As companies increasingly integrate control over both hardware and software, the future promises a far more powerful and efficient ecosystem than the legacy Wintel world.