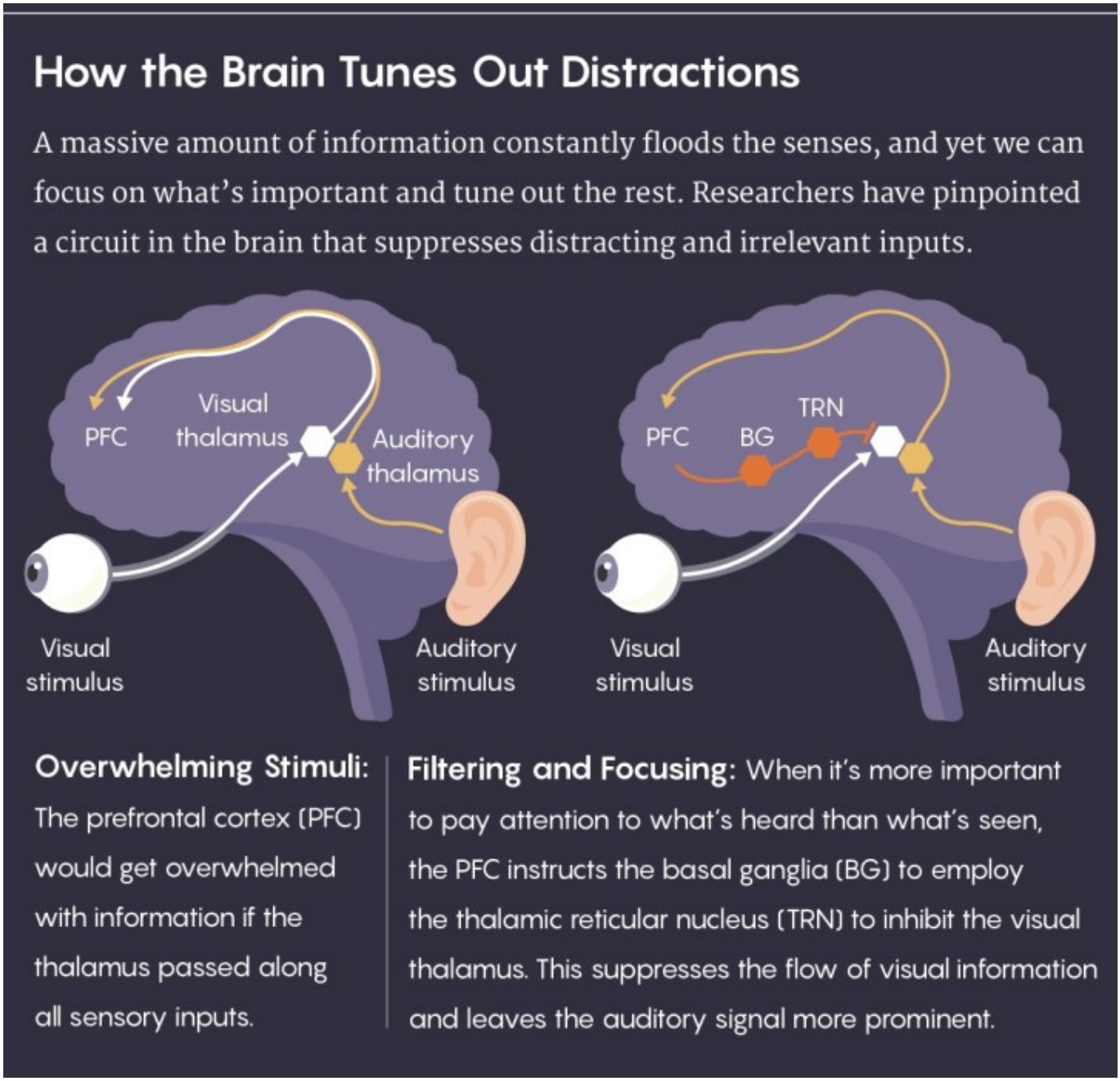
I have always wondered how a normal situation turns abnormal in a split second. Is it a twist of fate or is the brain programmed to do so in order to help in cognition? **How does the crew performing an approach to land continue to land on an unstable approach** despite the SOP's which have multiple checks and call outs from the second pilot? The general perception is that the brain is facilitating attention by blocking out certain sensory inputs but the flip side is that **when the pilot is focusing on the vision to sight the runway, the brain can also be filtering out sensory inputs from the co-pilot to discontinue the approach and go-around for safety reasons.** Similarly, if you are engaged in an intense conversation over the phone while driving, it doesn't matter if the phone is held in the hand or you are using a hands-free, the brain is more engaged in the conversation than driving and unexpected objects might be missed.

Preventing distractions

Imagine yourself parking your car in a tight space with music playing or your fellow passenger talking to you. You would notice that the **music or the chatter decreases as the level of attention on manoeuvring the car increases.** Similarly, if you attempt to solve a mathematical problem which increases in difficulty while you are running, the pace decreases as the level of difficulty increases.

What is happening here? The **brain is shutting down certain processes or inputs in order to divert the cognitive power or in our case the attention to the task in hand.**



Lucy Reading-Ikkanda/Quanta Magazine

When it is dark and raining or the crew just might be fatigued and wants to get back home, the priority might just be to sight the runway lights and the pilot flying's brain might filter or block the co-pilots inputs.

Discovering Thalamus

It was widely believed that the cortex which is the outmost layer of the brain on the front is responsible for housing the attention steering mechanism into the brain. **Francis Crick who was the co-discoverer of the DNA structure suggested in 1984 that a simpler structure called Thalamus might also play a role in this process.** Crick proposed that the Thalamus might filter the sensory inputs based on what we want to focus on.

Unconscious control

To test Crick's theory, three Macaque monkeys were trained to pay attention on spots of light when focussed on their arm. The results showed a quick surge in the region of Thalamus that relays information to the Cortex & a split second later a drop in the thalamic reticular nucleus (TRN), a structure known to turn off sensory information during sleep.

The experiment concluded that the **TRN acts as a gatekeeper and selectively allows images which deserve attention to pass through the Thalamus to the Cortex.** If Thalamus was the gateway to the Cortex then TRN was the gatekeeper.

Hierarchy of attention

Michael Halassa, a neuroscientist at the MIT discovered how animals select what to focus on when their attention is divided amongst different senses. While working on an experiment with mice's attention by using established techniques of shutting down various brain regions to see what interfered the performance, they discovered a new gating system.

The Pre Frontal Cortex (PFC) was issuing high level commands to other parts of the brain. It was also observed that if the trial required the mice to pay attention to vision, turning on neurons in the visual TRN interfered with their performance. When those neurons were silenced, the mice had more difficulty focussing to sound.

In effect, **the network was controlling the inhibitory processes, not excitatory ones, with the TRN inhibiting information that the prefrontal cortex deemed distracting.** If the mouse needed to prioritize auditory information, the prefrontal cortex told the visual TRN to increase its activity to suppress the visual thalamus — stripping away irrelevant visual data. The brain was working in a reverse process.

The research also concluded that the filtering mechanism not just filters one sense from another but filters within one sense too. When the mice were cued to pay attention to certain sounds the TRN helped filter the unwanted sounds from the background.

Ian Fiebelkorn, a cognitive neuroscientist commented ” what is interesting is that the filtering starts even before the he information reaches the visual cortex”. This is obviously a weakness of the brain that jettisons what might be important information.

Safety mechanism

Ian Fiebelkorn says that there is a safety mechanism in the brain which distracts the brain periodically. **The attention span gets weaker about four times a second.** T**his brief suppression period gives** the opportunity to the brain to prevent staying overly focussed in one location.

mindFly analysis

It is considered a good trait to stay focussed on the task in hand. However, from a flight crew’s perspective, it is more important to stay in the present or being mindful of the body and the surrounding environment. The brain has certain filtering mechanisms as explained above. There are also certain defence mechanisms that distract the brain periodically. Therefore, a balance is required between focus and distraction. The control over the breathing process provides a median around which the two processes of focus and distraction are controlled.

Similar to the human spinal cord, muscles on both sides need to be developed in order to have a stable balance. therefore both focus and distraction have a purpose and they must be appreciated and controlled. The co-pilot, therefore, must not just give a call and wait for the appropriate response as per the SOP but at times give repeated calls or physically tap the Pilot Flying out of the lock. The window of opportunity is always there but it's for the crew to be adequately trained to recognise.

An example of an unstable approach and mitigation can be by an audio and visual indication of a go-around. The pilot will receive the message through one of the two senses. The last option is to touch.

Danger- What if the co-pilot is also stuck in the same situation as the pilot flying is? That is the danger of mirroring, the co-pilot must have different references to scan.

> *What's common between a phone conversation & what could have been the worlds worst air disaster:mindFly*
