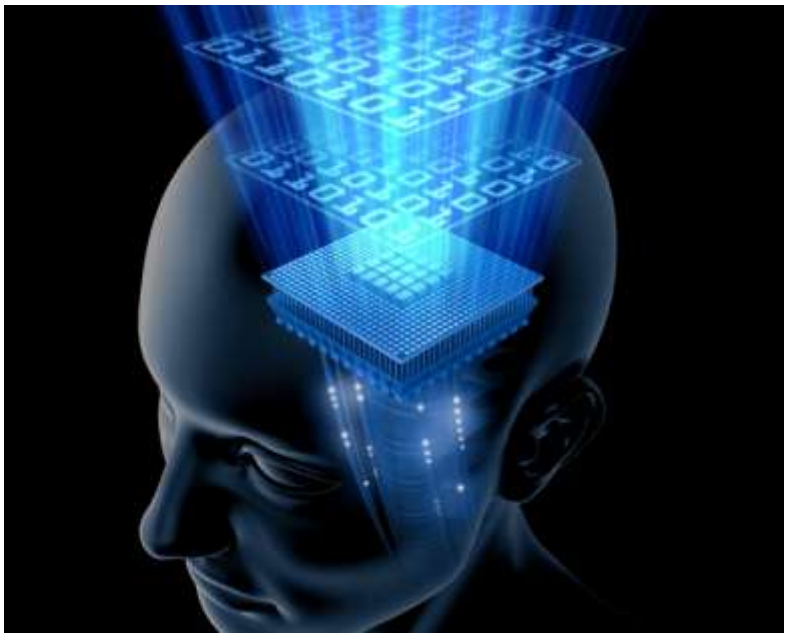
COMPUTER CHIPS MODELED AFTER THE HUMAN BRAIN

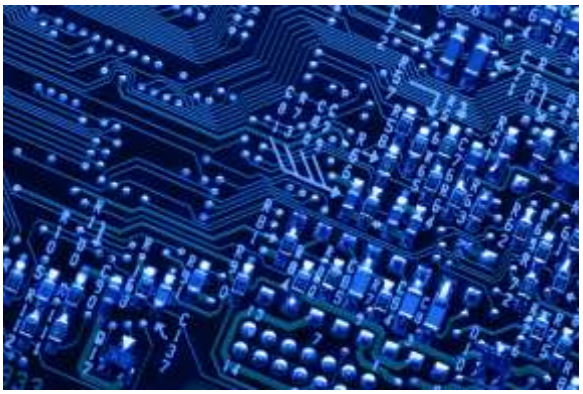


I dare you to look at contemporary computer chips and not admire their abilities. The most impressive example may be the realized dream of hand-sized smart-phones, pieces of technology we already tend to take for granted. And yet – with all their condensed might packed into a few square centimetres, those chips are nearing their developmental boundaries.

Try to open your computer case and have a look. Ignore the dust! See all those messy cables inside? Modern computer architecture is crippled by the fact that data has to flow between the different parts of the computer: The CPU (central processing unit), hard-drive, the RAM, the video card, etc. (namely – those green cards that you see inside the computer case).

Although tremendous efforts have been made to accelerate those transitions, the data flow between those parts still poses a serious bottleneck on the performance of computers since software commands have to be executed sequentially.

A new study from Boise State University suggests a better solution to the problem: computer chip architecture modeled after the human brain.



Instead of a central processing unit overwhelmed by data flow from different computer parts, the new architecture will be based on the way the human brain functions. Multiple areas – each one processing it's own part, contribute together to create the bigger picture. This kind of architecture eliminates the need for the major processing and memory units. Instead of a hard-drive, the RAM, the video-card and most probably the CPU itself, a new kind of universal electronic chip will process and store the data on its own.

According to the principal investigator of the research grant, Elisa Barney Smith, *By mimicking the brain's billions of interconnections and pattern recognition capabilities, we may ultimately introduce a new paradigm in speed and power, and*

potentially enable systems that include the ability to learn, adapt and respond to their environment.

The neural approach is now becoming practical thanks to the on-going development of a new type of resistor: the memristor. Memristors can be tweaked to new resistance levels by applying and removing electric currents. Memristors "remember" the last resistance applied to them even after the power is removed. In simple words – a storage effect appears. An idea first conceived in 1971, for many years memristors puzzled physicist and engineers as a theoretical missing link component until recent developments finally made them practical. Although not yet commercially used, memristors are already taking active parts in research. Dexter Johnson from The Nanoclast goes into greater detail regarding memristors:

The memristor has been on a rapid development track ever since and has been promised to be commercially available as early as 2014, enabling 10 times greater embedded memory for mobile devices than currently available.

The obsolescence of flash memory at the hands of the latest nanotechnology has been predicted for longer than the commercial introduction of the memristor. But just at the moment it appears it's going to reach its limits in storage capacity along comes a new way to push its capabilities to new heights, sometimes thanks to a nanomaterial like graphene.

Using memristors, the team hopes to apply algorithms inspired by the interaction between the neural synapses of the human brain. The effect should follow the intricate patterns our brain implements to process and store data.

Apart from sounding super-cool (in a geek-ish way), this new approach harbors multiple advantages. First – a tremendously increased processing power. Thanks to mother nature (or depending on what you believe), our brain proves to be quite efficient in processing data. The new generation of computers will benefit from that very same system. Second – the new chips will be considerably more power efficient, suggesting they may be used in places where power support is an issue. We may expect an additional decrease in electronic-chip sizes as well.

Source: http://wondergressive.com/computer-chips-modeled-human-brain/