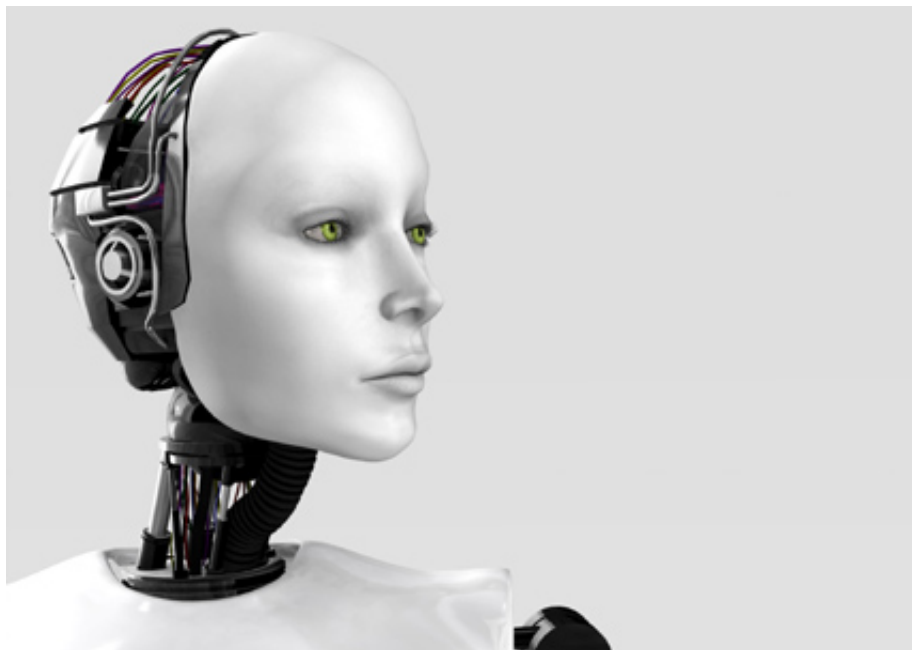# Yes, the Internet Is Changing Your Brain

As you read these words, your brain is being changed.

Every day, as you surf the internet, clicking on hyperlinks, opening new tabs and windows, flicking between e-mail, Twitter, Facebook and whatever it was you were reading just now, your patterns of thought are changing. And neuroscientists have amassed solid evidence that when we change our thinking, we change our brain.

In recent years, several prominent thinkers and writers have become concerned that heavy internet use is eroding their concentration, memory and capacity for deep thought. And as they have become aware of the findings of neuroscience, they are increasingly alarmed about what this is doing to their brains:

> *Over the past few years I've had an uncomfortable sense that someone, or something, has been tinkering with my brain, remapping the neural circuitry, reprogramming the memory. My mind isn't going-so far as I can tell-but it's changing. I'm not thinking the way I used to think. I can feel it most strongly when I'm reading. Immersing myself in a book or a lengthy article used to be easy. My mind would get caught up in the narrative or the turns of the argument, and I'd spend hours strolling through long stretches of prose. That's rarely the case anymore. Now my concentration often starts to drift after two or three pages. I get fidgety, lose the thread, begin looking for something else to do. I feel as if I'm always dragging my wayward brain back to the text. The deep reading that used to come natu-*

rally has become a struggle.

I think I know what's going on. For more than a decade now, I've been spending a lot of time online, searching and surfing and sometimes adding to the great databases of the internet.

(Is Google Making Us Stupid? by Nicholas Carr)

In a recent piece for the Guardian, John Naughton picks up on Carr's theme and asks: **The internet: is it changing the way we think?**. He laments the fact that "[no-one] bothers to write down or memorise detailed information any more", and canvasses the views of a panel of writers and academics, several of whom share his unease:

Sometimes I think my ability to concentrate is being nibbled away by the internet; other times I think it's being gulped down in huge, Jaws-shaped chunks.

(Geoff Dyer, quoted in The internet: is it changing the way we think?)

So how worried should we be?

Your Plastic Brain

Let's start with the science. Nicholas Carr is absolutely right to make a connection between mental activity and the structure of his brain. The phenomenon of **neuroplasticity** means that when we learn a new skill, or change our patterns of thought, we are rewiring our brains, with new connections forming between neurons:

For a long time, it was believed that as we aged, the connections in the brain became fixed. Research has shown that in fact the brain never stops changing through learning. Plasticity IS the capacity of the brain to change with learning. Changes associated with learning occur mostly at the level of the connections between neurons. New connections can form and the internal structure of the existing synapses can change.

(Brain Plasticity: How Learning Changes Your Brain by Dr Paschale Michelon)

I'm no neuroscientist but I gather this view is uncontroversial within the field, and supported by a lot of research evidence. The way we think affects neuronal structure.

Change your thinking and you change your brain.

Your Monkey Mind

I can relate to Carr's experience of switching from a book culture to a digital culture. I've been a bookworm from an early age. Over the last five years, since I started blogging and marketing my business via the web, I've become a heavy internet user. I now spend several hours online every working day, using Gmail, Twitter, WordPress, Google Reader and a whole range of different websites.

When I sit quietly, close my eyes and observe my mind, it's like gazing into a rainforest full of criss-crossing branches and overlapping leaves, flickering, swaying and shifting in the breeze. Thoughts, images, words, and feelings come and go apparently at random, one triggering another with little semblance of logical thought or progression.

Did you notice the journalistic trick I just pulled?

By placing the last two paragraphs next to each other, I implied that my heavy internet use was responsible for the illogical jumble of thoughts in my mind. In fact, the second paragraph is based on an experience I had about 15 years ago, when I'd barely encountered the internet, and started practising **meditation** for the first time.

What I discovered was that, although we like to think of our minds as logical, ordered sanctuaries of reason, the reality is very different.

> *The undisciplined mind is easily agitated, nervous, wanting, fearful, preoccupied, distracted, scattered, and confused. In meditation we can begin to see just how busy and distracted our minds really are.*
>
> (*Meditation Now or Never by Steve Hagen*)

Pick up just about any book on Buddhist meditation, and you'll find a similar description. Texts often refer to the 'monkey mind' hopping from thought to thought like the branches of a tree. And considering they are all based on the 2,500-year-old teachings of the historical Buddha, it seems a little premature to blame the internet for our monkey minds.

When Nicholas Carr writes "I've had an uncomfortable sense that someone, or some-

thing, has been tinkering with my brain, remapping the neural circuitry, reprogramming the memory", it's as though the internet were imposing some alien thought patterns on him. But all the internet is doing is exaggerating the *natural* tendency of the mind to keep skipping from thought to thought.

What is unnatural is the habit of spending "hours strolling through long stretches of prose". The internet may be changing our brain, but books changed it first.

The Benefits of Non-linear Reading

Carr says he finds it hard to read an extended prose narrative. Me too. I so rarely read a novel these days, that it's become (ahem) something of a novelty. But I didn't give up the novel-reading habit recently – I did it nearly 20 years ago. And the culprit wasn't the internet, but my degree in English Language and Literature.

The more novels I ploughed through at college, the more I realised how average most of them are. And the fact that these average novels averaged 300-500 pages each, made me less and less eager to read another one. If a poet's no good, it's usually obvious within a few pages, but novelists take longer to disappoint you. After a while, I ran out of patience and devoted most of my time to reading the poets.

Another reason for the switch was that I found prose less and less stimulating to read. A lot of the time, it felt like watching a grainy black-and-white TV picture, compared to the three-dimensional, vibrant colours of poetry. (Just to be clear: I'm not talking about the really great novels. I'll always have time for one of those.)

As a lifelong book lover, I have some sympathy with Carr when he extols the virtues of the printed page:

> *The kind of deep reading that a sequence of printed pages promotes is valuable not just for the knowledge we acquire from the author's words but for the intellectual vibrations those words set off within our own minds.*

But note his emphasis on a *sequence* of pages, as if a linear narrative or argument were the only way to stimulate 'intellectual vibrations'. What Carr forgets when he laments the hours he spent "strolling through long stretches of prose" is that there are other, older, ways of reading and being stimulated by words, which are not necessarily worse.

Reading a poem is not a linear experience. The closest examples are long narrative poems like *The Odyssey* and *Paradise Lost*. Yet even here, the poets undercut the narrative progression with devices – such as Homer's famous recurring phrases ("the wine-dark sea") or the repetitive, hypnotic beat of Milton's iambic pentameter – that take us into a timeless zone of the imagination.

Lyric poetry is even less linear. When you first glance at a short poem on the page, you take the whole thing in at once, as a visual shape. As you read it, you encounter elements such as rhythm, rhyme, and verbal echoes that prompt you to read backwards and sideways as well as forwards. Words and phrases act like hyperlinks, prompting you to make connections between different parts of the same poem, different poems within a book, and even poems by other writers. When T.S. Eliot wrote:

> *A crowd flowed over London Bridge, so many,*
> *I had not thought death had undone so many.*

he meant us to recognise the second line as a quotation from Dante's *Inferno*, and to draw a parallel between commuters in modern London and the souls of the damned in the underworld. The effect is heightened by the repetition of the words "so many" at the end of each line. To me, this is the kind of thing that makes reading a poem, on average, a richer experience than "strolling through long stretches of prose".

There may be people who read a poetry collection by starting at beginning and reading to the end, but I'm not one of them. I generally start with the first poem, then skip to the last one, then dip in somewhere in between, in search of something good. I read some poems over and over again, and leave others for later discovery. If I really like the poems I find in this way, I'll go back and read the book right through, which will add another dimension to my reading, but not necessarily the most important one. Even after I've done that, if the book's any good, I'll go back to re-read individual poems.

It's more like listening to a CD than reading a novel. Sometimes you play the whole thing through, others you skip around, playing your favourites over and over again.

Or to change the analogy, it's a bit like reading on the internet. Even when I stay on the same website, I don't start at the beginning (wherever that might be) and read the whole thing all the way through. I hop around, slowing down when something piques my interest, and skipping back and forward when the author starts to waffle.

Is Google Making Us More Intelligent?

One of the criticisms of the way people read on the web is that they just 'skim' the text, using subheadings and bullets to get the gist of a piece of writing and rarely reading the whole thing from start to finish. Clearly we are in danger of dumbing down if we *only* read the bullets and subheadings. But I don't think that's how it works.

I believe a lot of internet users are actually very engaged and discerning readers: skimming through streams of links and updates for interesting pieces; zooming in by clicking on the link; scanning the text to get the gist of it; slowing down to clarify understanding of an important point; moving backwards and forwards in the text; and opening other tabs to compare and contrast different pages.

In other words, many internet users are *active* readers, engaging their critical faculties as they read, and even engaging the authors and other readers in debate. And they may not read every single word in the 'right' order, but a lot of the time they are doing something at least as complex and demanding.

This is the conclusion reached by neuroscientists at the University of California, in a research study reported by the *Telegraph*:

> *Scientists discovered that searching the world wide web exercised the mind far more than reading and was similar to completing crosswords and puzzles.*
>
> *Brain scans showed that going online stimulated larger parts of the brain than the relatively passive activity of reading a novel or non-fiction book.*
>
> *It was so stimulating that the authors of the study believe it could actually help people maintain healthier brains into their old age.*
>
> (***The internet beats books for improving the mature mind*** *by Richard Alleyne)*

The researchers asked subjects to first read books and then perform searches on the internet, while their brain activity was monitored by functional magnetic resonance imaging (fMRI). The subjects included both experienced internet users and people who had no experience of performing searches online.

All study participants showed significant brain activity during the book-reading task, demonstrating use of the regions controlling language, reading, memory and visual abilities, which are located in the temporal, parietal, occipital and other areas of the brain.

But internet searches revealed a major difference between the two groups. While all participants demonstrated the same brain activity that was seen during the book-reading, the web-savvy group also registered activity in the frontal, temporal and cingulate areas of the brain, which control decision-making and complex reasoning.

In other words, while all subjects found the books stimulating, the experienced internet users' brains were more actively engaged in complex thought processes when searching online.

I think it's significant that this extra engagement was observed only in the experienced web users. To me, it suggests an aspect of reading on the web that seems to have been ignored by those who scoff at skimming and scanning as 'shallow'.

To appreciate T.S. Eliot's great poem *The Wasteland*, you need to have also read and absorbed a lot of other literature, ancient and modern. Otherwise you won't 'get' the references, and his brilliant reworking of traditional verse forms, and you'll miss a lot of the poem's meaning.

On the internet, context is just as important. Many of the thousands of blog posts, Tweets and forum discussions published every day make little or no sense without a deep knowledge of the authors, technology, media trends and online etiquette – not to mention what other authors have written on the same topic. Even if you're only searching for a new ironing board, your search will be more effective of you have a 'map' in your mind of the best online retailers and price comparison sites.

Yes, the hyperlinks help to knit things together, and you can always ask Google if you forget something, but to get the most out of her reading, the average web reader needs to hold a cultural universe in her head of similar complexity to the one Eliot relied on for *The Wasteland* to make sense.

And as we know, associative, holistic, big picture thinking is good for creativity. **Making new connections** between ideas, people and cultures makes this an exciting time to be a reader – and a writer.

Choose Your Brain with Care

Yes, the internet is changing your brain. But so is just about everything else you do.

Reading through the discussions of this issue, I couldn't help noticing that most of the hand-wringing is by those (like me) with a background in the arts and humanities. Many of them sound a little squeamish about neuroplasticity, as if it were some kind of brain damage instead of the natural way the brain learns and adapts.

The scientists seem much more comfortable with neuroplasticity, and the implication that our daily activities mean we are responsible for shaping the structure of our brain.

> *Critics of new media sometimes use science itself to press their case, citing research that shows how "experience can change the brain." But cognitive neuroscientists roll their eyes at such talk. Yes, every time we learn a fact or skill the wiring of the brain changes; it's not as if the information is stored in the pancreas. But the existence of neural plasticity does not mean the brain is a blob of clay pounded into shape by experience.*
>
> (*Mind Over Mass Media* by Steven Pinker)

Whether you spend your days reading three volume novels or flittering from Tweet to Tweet will affect the kind of brain you build for yourself. So will your decision to learn tennis, play the violin, **memorise the entire London streetmap**, start a new company, write a symphony, or spend your days mindlessly crunching spreadsheets and hitting 'send and receive' on Outlook Express.

Choose carefully, because you're choosing your future brain.

The Antidote to a Short Attention Span

I'm not saying I don't share some of the concerns expressed about loss of concentration or memory. I've noticed several of the symptoms described by Carr in myself. But there's a big difference between saying there are drawbacks to our new ways of reading and thinking, and prophesying the end of civilisation as we know it.

The idea that technology is making us stupider, and that scholarship, the arts and sciences are consequently in danger of decline, is a good example of what economist

Tyler Cowen calls **cultural pessimism**. Human beings have a natural a tendency to assume that modern culture is in decline, and that the present generations (particularly the youngsters) are intellectual pygmies compared to the giants of the past.

But amid all the agonising about the possible effects of the internet on our brains, I haven't seen many people offering realistic, practical solutions. So at the risk of dumbing this article down into a list of top tips, here are some things you could do to make the transition to your new brain a little smoother. 😊

If you want to improve your concentration, practise concentrating.

Before I started writing this piece, I spent 20 minutes sitting on a mat, staring at the wall, concentrating, to the best of my ability, on the breath flowing in and out of my nostrils. I do this every morning. If the weather's nice, I'll go out into the garden and practise **walking meditation**, but the practice is essentially the same: using *samatha* (concentration) to calm the monkey mind and increase my ability to concentrate, and *vipassana* (insight) to observe the stream of thoughts and feelings, and try not to get caught up in them.

I started doing this long before the internet came along, as a way of counteracting the mind's natural tendency to wander hither and thither. And these days, I find it an an excellent antidote to the digital distractions of the internet.

You don't need to take up meditation, but if you are worried about the effect of all those hours on Facebook on your brain, then start a daily practice of something that will counteract this, by strengthening your powers of your concentration:

- yoga
- tai chi
- playing a musical instrument
- making something with your hands, with total focus on what you're doing
- writing (with the internet turned off!)
- playing a sport that requires absolute focus

You could also try building 'digital downtime' into your day – several hours without digital media of any kind (and yes, that includes your smartphone!).

Well, there it is. This has been a long post even by my standards, and I'm fully aware

that some of you may not have read it all the way through to the end. That's fine, I know it's my job to earn your attention, not take it for granted.

And I've written it on the assumption that those of you who find it of interest will have plenty of mental capacity to follow my argument all the way through – and either build on it or take it to pieces in the comments…

You, Your Brain and the internet

Are you concerned about effect of the internet on your mind and brain?

Do you agree that there are positive, creative benefits to non-linear reading?

Any tips for dealing with the 'monkey mind' after spending too long online?

About the Author *Mark McGuinness invites you to sculpt yourself a more creative and productive brain by subscribing to **free updates** from Lateral Action. For briefer neurological interventions, follow Mark on Twitter **here**.*