Jayne Jubb

ON THE BORDER

Info & insights from the interface between energy healing & science

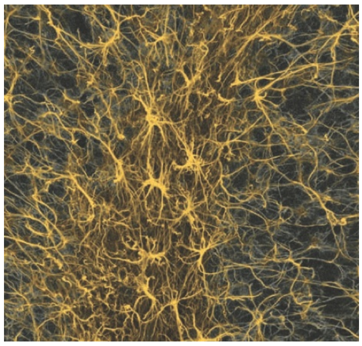
November 2011

Welcome to the November 2011 edition of 'On the Border'.

For those of you new to 'On the Border', this is Jayne's monthly Ezine newsletter about the latest information and insights into energy fields, healing and science. Each month I share with you some of the latest research and how it applies to healing, energy work & (daily) life. There's a Fascinating Facts section and also a 'Freebie' where you get something for nothing, gratis.

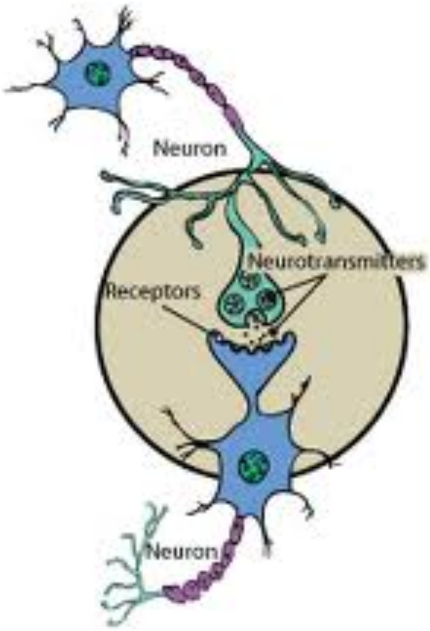
Neurons Are Not the Only Fruit

I love it when science is arrogant and then has to eat its words!
Remember the notions that 85% of DNA is junk? Or that the earth is the centre of the universe?
Neuroscience has a big mis-hypothesis too….'Neurons make up only 15% of our brain cells, the remaining 85% is packing material.' This turns out to be hugely wrong.



Until recently, our understanding of the brain was based on a century-old idea called the *neuron doctrine*. This theory holds that all information in the nervous system is transmitted by electrical impulses over networks of neurons linked through synaptic connections. But this bedrock theorem is deeply flawed. New research proves that some information bypasses the neurons completely, flowing without electricity through networks of cells called glia. Once dismissed as a mere packing material, glia make up 85 percent of the cells in our brain and are now known to control many of the brain's functions. The studies are upending our understanding of every aspect of brain function in health and disease, bringing answers to long-standing riddles about how we remember and learn.

Especially exciting is new research showing the central role of glia in information processing, neurological disorders and psychiatric illness. Some glial cells speed information between distant regions of the brain, helping us master complex cognitive processes. Others break down as they age and in their failure bring dementia. This research has great implications not only for understanding how the brain works but also for developing new treatments for neurological and psychological illnesses.



All this comes down to a class of brain cells dismissed for 100 years as mere putty. In the 19th century, when pioneering scientists first trained microscopes on gray matter, they were amazed to find a cell unlike any other in the body: the neuron. At one end of this dazzling cell was a long, wirelike structure called the axon that carried electrical impulses to a cluster of transmission terminals. At the opposite end, the neuron sprouted busy, root-like dendrites that received signals from the axons of other neurons, ferried across the space that separated them—the synapse—by tailor-made chemicals. Neurons were scattered sparsely throughout the brain like juicy raisins, but few cared to examine the seemingly bland dough in which they were embedded.

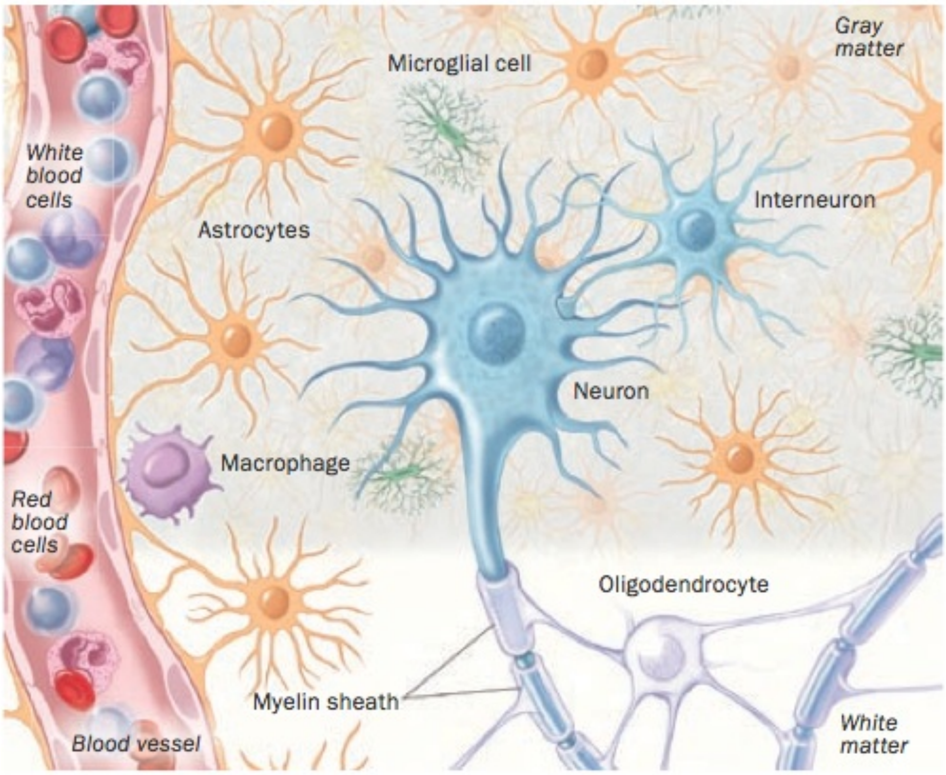
Sherlock Holmes observed, “There is nothing more deceptive than an obvious fact,” and the fact that scientists were ignoring is that neurons make up only 15 percent of our brain cells; the other 85 percent were considered little more than packing material. Indeed, 19th-century German pathologist Rudolf Virchow, one of the first to study glia, likened this brain matter to connective tissue and called it *nervenkitt*, meaning nerve putty or cement, which in English became “neuroglia,” from the Greek root for glue.

However, few scientists are drawn to brain research to study glue!
Virchow barely distinguished between the different sorts of glia. And none of this mishmash of bizarre-looking cells had any of the telltale features essential for neuronal communication, such as axons, dendrites or synapses, so scientists had no reason to suspect that glia might be communicating in secret and doing so in an unexpected way.

A Language of Their Own

Neurons use both electricity and chemistry to convey information, with electricity transmitting impulses along the wirelike axon and chemicals carrying those signals across the synapse to another neuron. The recipient neuron then fires an electrical impulse and relays the signal to the next neuron in the chain.

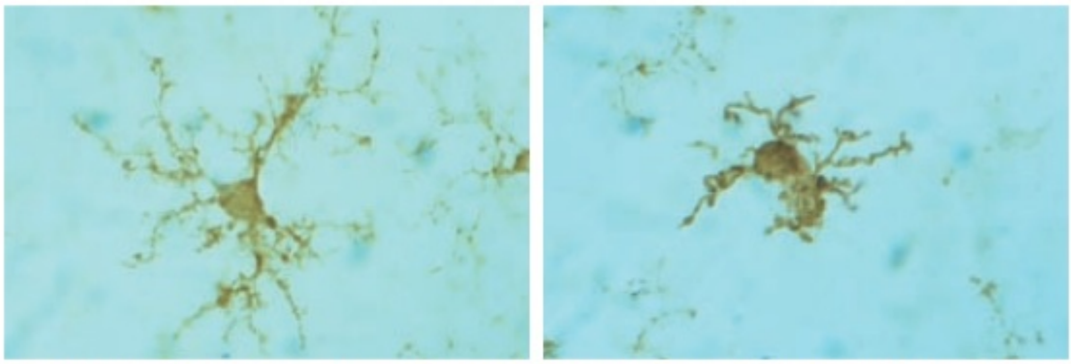
Only in the past few years have scientists come to realise that the glial cells called astrocytes can control synaptic communication. So named because early anatomists thought they resembled stars, astrocytes were at first thought to be responsible only for housekeeping functions such as transporting nutrients from the bloodstream to the neurons and carrying waste in the opposite direction. These functions were surmised from the way many astrocytes cling to blood vessels with some of their arms and reach deep into brain tissue with others, tightly grasping neurons and their synapses. Only later did scientists come to see that neurons are utterly dependent on glia to fire their electrical impulses and to pass messages to one another across synapses. A clue that this dependency might be the case was the discovery of the same neurotransmitter receptors on glia as on neurons. As it happens, glia were listening to neurons and talking among themselves without using electricity at all.



How the Brain Goes Wrong

Glial cells have also emerged as major actors in a host of neurological and psychological illnesses ranging from epilepsy to chronic pain to depression. Indeed, recent research has found that many neurological disorders are in fact disorders of the glia, in particular a class of cells called the microglia, which serve as the brain's defense against disease. These specialists seek out and kill invading germs and promote recovery from injury, clearing away diseased tissue and releasing powerful compounds that stimulate repair. And their function is a factor in every aspect of neurological illness.

New research suggests to some scientists that the dementia of Alzheimer's disease could be a direct outcome of microglia that have lost the ability to clear waste. Alois Alzheimer first noted that microglia surround the amyloid plaques that are the hallmark of the disease. Normally microglia digest the toxic proteins that form these plaques. But recent studies suggest that microglia become weaker with age and begin to degenerate. The atrophy is visible under a microscope. Aged and old microglia in aged brain tissue become fragmented, losing many of their cellular branches.



Many diseases of the nervous system are disorders of the glia. Compared with a normal microglia cell (*left*), the armlike extensions of the aging microglia at the right appear shriveled, a sign of dementia.

The way Alzheimer's courses through the brain is one more sign of microglial involvement. Tissue damage spreads in a predetermined manner, beginning near the hippocampus and eventually reaching the frontal cortex. Microglial degeneration aparently follows the same pattern—and in advance of neuronal degeneration, suggesting that aging of microglia is a cause of Alzheimer's dementia and not a response to neuron damage, as Alzheimer and most experts had presumed. This discovery may lead to new treatments for dementia, once researchers determine why microglia become 'old' with age in some people but not in others.

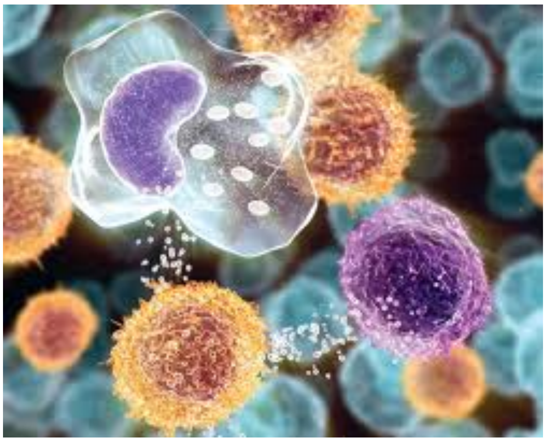
The functions of the glial cells also account for why some people develop horrible chronic pain that does not relent after an injury has healed and sometimes even worsens. Doctors must use powerful narcotics such as morphine and other opiates to blunt the unrelenting pain in such patients. These drugs lose their strength over time, necessitating higher doses for the same effects, which can lead to drug dependence.

It is now known that malfunctions of glial cells may account for both persistent pain and the diminishing power of some pain-relieving drugs. Research reveals that microglia and astrocytes respond to the increased activity in pain circuits after injury by releasing compounds that initiate the healing process. These substances also stimulate neurons. Initially this heightened sensitivity is beneficial, because the pain forces us to protect the injury from further damage. With chronic pain, microglia do not stop releasing these substances even when healing is complete. But in recent studies, pain in experimental animals was sharply reduced when the researchers blocked either the signals from neurons to glia or the signals that glia release. Scientists are now developing painkillers that target glia rather than neurons.

Glial cells also account for the ancient mystery of why spinal cord injury results in permanent paralysis. Proteins in the myelin insulation that oligodendrocytes wrap around axons stop injured axons from sprouting and repairing damaged circuits. Blocking these proteins allows damaged axons to regrow in experimental animals. Clinical trials on patients with spinal cord injury are now under way.

Is Mental Illness All in the Brain?

That glia would play a central role in neurological illness is easy to understand because astrocytes and microglia are the first responders to disease. Diseases such as multiple sclerosis, which strip the myelin insulation from axons, cause severe disability. But it came as a surprise to find glia implicated in psychiatric illness.



Chemicals called cytokines are released by immune system cells and microglia. These cytokines have recently been linked to obsessive-compulsive disorder. Mice with a mutation in the *Hoxb8* gene showed compulsive grooming and hair removal behaviour similar to humans with obsessive-compulsive disorder. The only cells in the brain that have this gene are microglia. Then, in a 2010 study, the researchers harvested immature immune cells that will develop into microglia from normal mice and transplanted them into the mutants. The mice were cured of their compulsive grooming behaviour. Presumably cytokines released from microglia excite brain circuits responsible for habit formation.

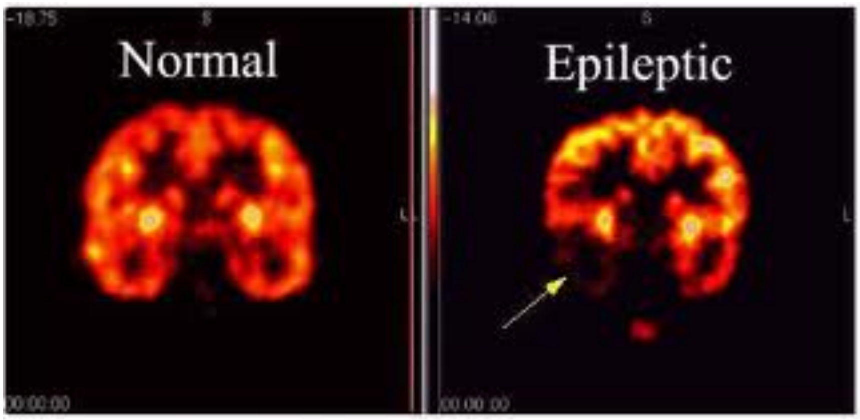
Analysis of postmortem brain tissue has also linked oligodendrocytes and astrocytes to depression and schizophrenia by revealing reduced numbers of these cells. So have MRI examinations of people with schizophrenia, which show anomalies in subcortical white matter regions of the brain. Although psychiatric illnesses are likely to have many different causes, schizophrenia and several other mental illnesses have a strong genetic basis. If an identical twin develops schizophrenia, there is a 50–50 chance that the sibling will as well.

Some of the genes implicated in these mental illnesses are found only in oligodendrocytes; others control development of these myelin-forming glia. An analysis of 6,000 genes in tissue from the prefrontal cortex of people with schizophrenia, revealed that 89 genes were abnormal; remarkably 35 of them are involved in myelination. Presumably these genetic abnormalities uset such processes as synaptic function and myelin insulation, which in turn could disrupt information transmission in the higher-level cognitive circuits affected in psychiatric illnesses.

Roots of Mental Illness

Investigators have set out to learn why glial cells would cause these synaptic screw-up. Consider that the biological basis for most mental illness is an imbalance in neurotransmitter chemicals in circuits controlling perception, emotion and thought. All drugs used to treat mental illness and most neurological diseases work by regulating the balance of neurotransmitters. The selective serotonin reuptake inhibitors (SSRIs) used to treat chronic depression and many other psychiatric conditions work by impairing removal of serotonin and dopamine from synapses, allowing these neurotransmitters to build up and in effect boosting the signal. In a similar way, all hallucinogenic drugs, from LSD to PCP, produce their mind-bending effects by altering the levels of neurotransmitters in specific neurological circuits. Regulating neurotransmitter levels at synapses is precisely what astrocytes do.

In theory, then, astrocytes are in a position to control the balance between mental health and madness. In a strange and largely forgotten coincidence, glia were the inspiration for the revolutionary idea that mental illness could have a biological cause and that psychiatric illness could be corrected with medical treatment, albeit a very peculiar one. In the 1930s Hungarian psychopathologist Ladislas von Meduna noticed during autopsies that the number of astrocytes was abnormally low in the cerebral cortex of people who had suffered from chronic depression and schizophrenia. Von Meduna and other pathologists also knew from examination of brain tissue obtained by biopsy that the number of astrocytes increases after epilepsy, presumably to regulate electrical activity when it spins wildly out of control.



Von Meduna observed as well that people with epilepsy rarely suffered schizophrenia. He surmised that a deficiency in astrocytes was the biological reason for schizophrenia and chronic depression. By inducing a seizure in such people, he could correct the imbalance in astrocytes and cure patients suffering from these illnesses. He later wrote in his autobiography: “I published this work in 1932 without knowing that this would become the origin of shock treatment.” How it works is still unclear, but electroshock therapy remains the most effective treatment for chronic depression in people who are not responsive to drugs.

The new awareness of glia in brain function suggests that drugs targeting glia might help treat mental and neurological illnesses. Epilepsy is a prime candidate for glial-based therapeutics. Recent studies using calcium imaging and electrophysiology to show that when neuronal activity is heightened, glia release neurotransmitters that can either contribute to seizure activity or suppress it. New research also implicates glia in sleep disorders, a component of many mental illnesses.

Until quite recently, neuroscientists had dismissed three-quarters of the brain as uninteresting….what a humbling realisation!
Just as in real life, we see that every component has its unique task, and it is the intimate working together that creates the astonishing abilities of the whole.

References

◆White Matter Matters. R. Douglas Fields in Scientific American, Vol. 298, No. 3, pages 54–61; March 2008.
◆Training Induces Changes in White-Matter Architecture. J. Scholz, M. C. Klein, T.E.J. Behrens and H. Johansen-Berg in Nature Neuroscience, Vol. 12, No. 11, pages 1370–1371; November 2009.
◆Nonsynaptic Communication through ATP Release from Volume-Activated Anion Channels in Axons. R. Douglas Fields and Yingchun Ni in Science Signaling, Vol. 3, Issue 142, ra73; October 5, 2010.
◆Change in the Brain's White Matter. R. Douglas Fields in Science, Vol. 330, pages 768–769; November 5, 2010.
◆Action-Potential Modulation during Axonal Conduction. Takuya Sasaki, Norio Matsuki and Yuji Ikegaya in Science, Vol. 331, pages 599-601; February 4, 2011.
◆ The Other Brain. R. Douglas Fields, Simon and Schuster, 2011.
◆The Hidden Brain. R. Douglas Fields. Scientific American Mind, volume 22, number 2, pages 52-59, 2011.

Fascinating Facts

Did you know that……the following people have said this about the brain?

The seat of the soul and the control of voluntary movement - in fact, of nervous functions in general, - are to be sought in the heart. The brain is an organ of minor importance (Aristotle)

The nuclear generator of brain sludge is television (Dave Barry)

No, indeed; I don't know anything. You see, I am stuffed, so I have no brains at all (The "Scarecrow" in *The Wizard of Oz*)

Children use the fist until they are of age to use the brain (Elizabeth Barrett Browning)

Reading, after a certain age, diverts the mind too much from its creative pursuits. Any man who reads too much and uses his own brain too little falls into lazy habits of thinking (Albert Einstein)

A man who works with his hands is a laborer; a man who works with his hands and his brain is a craftsman; but a man who works with his hands and his brain and his heart is an artist (Louis Nizer)

The human brain starts working the moment you are born and never stops until you stand up to speak in public (George Jessel)

Estimated amount of glucose used by an adult human brain each day, expressed in M&Ms: 250 (Harper's Index, *October 1989*)

A collection of a hundred great brains makes one big fathead (Carl Gustav Jung)

November Freebie

In this section you get the chance to get something for nothing. Helemaal gratis. Always a pleasure!

Are you somebody who tends to have a birds' eye overview of a situation? Or do you tend to zoom in on the details?

This month's Freebie allows you to do both: from outermost space to the inner most atomic particles, this link helps you to both visualise and travel from macro to micro and back again.

http://primaxstudio.com/stuff/scale_of_universe/
(Thanks to Davorka Ruskac for sending me this)

Contact Details

Email: jayne@jaynejubb.com
Website: www.jaynejubb.com
Telephone: 020-6206680, or from outside The Netherlands ++31 20 6206680.

Back Issues

If you have missed any of the previous issues, then the main articles and full newsletter pdf links can be found at www.jaynejubb.com/backissues.htm The Freebies each month are only valid for that month....

Subscription Management

On The Border is a monthly Ezine/Newsletter published the second Tuesday of each month. This Email was sent to you because you are on my mailing list and/or have subscribed directly to it. If you no longer wish to receive this then please unsubscribe by clicking either clicking on the link at the end of the original Newsletter Email, or send me directly an Email – and I'll unsubscribe you immediately.

If you have received this Ezine Newsletter from a friend because you are not on my list, but would like to be, then please send me an Email and I can get you signed up immediately.

My subscriber list is not made available to other companies or individuals. You are trusted and valued clients and I certainly will not abuse that trust!