

Sexing the Brain: how NeuroNonsense joined Psychobabble to 'Keep Women in Their Place'.

Blame the brain! Is women's biology the basis of their inferior position in society?

"There is perhaps no field aspiring to be scientific where flagrant personal bias, logic martyred in the cause of supporting a prejudice, unfounded assertions, and even sentimental rot and drivel, have run riot to such an extent as here" (Woolley, 1910).

Helen Thompson Woolley was writing exactly 100 years ago in "A review of the recent literature on the psychology of sex". One might hope that this backward glance would be from a position of enlightened objectivity, harnessing the stunning technological advances in brain research to inform our understanding of the relationship between brain and behaviour, and allowing us to cast aside ill-informed stereotypes and prejudice. Would that it were so!

Throughout history, biological explanations have been used as weapons to explain and maintain social differences. This is especially true of attempts to define women's role in society - biology is destiny, and women's biology is vulnerable if not downright defective. Brain research is not exempt from use of this type of indoctrination. Reporting of research into sex differences in the brain (and, unfortunately, the research itself) can be misogynist (based on barefaced prejudice, lies, damn lies, and let's not even bother with statistics); misleading (where how you ask the questions loads what answers you get); misquoted (where baby chicks can become eagle-eyed [male] aviators) and misguided (be careful what you look for and even more careful how you tell the story).

This leads to the production of what I would like to call 'neurotrash' - populist books on the 'brain bases of sex differences. The logic of their argument is that males and females are biologically different, men and women

are behaviourally different, so their behavioural differences are biologically caused and cannot and, more importantly, should not be challenged or changed. I aim to show that each of these assertions is, at best, the product of misunderstanding and misrepresenting the underlying science, and produce a guide to spotting such 'neurononsense'. Are we succumbing to 'neurohype', do we really know what those beautiful brain images are telling us? Are we dichotomising differences and sustaining stereotypes? How can we avoid 'brain bloopers'?

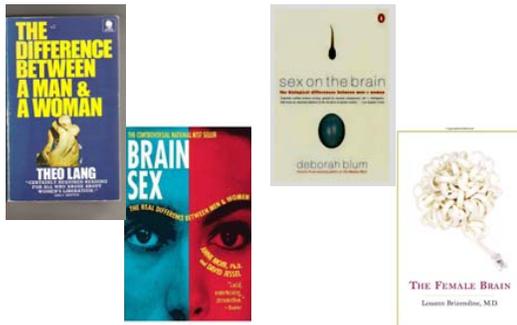
Women's Place.

Firstly, what is the problem? It is an assumption that women's primary (if not sole) role in society is determined by their biology, to be a mother/homemaker and deviations from this destiny (such as becoming 'over-educated' or trying to enter 'male' occupations will be damaging for them their families and the future of society. It is not an unspoken assumption either. In the last century this prejudice was supported by lofty statements from (male) authorities, full of rousing 'psychobabble'. These were wonderfully summarized by Naomi Weisstein in her (1968) paper: *Psychology Constructs the Female*, unearthing quotes from Joseph Rheingold, a Harvard psychiatrist: "...*anatomy decrees the life of a woman...When women grow up without dread of their biological functions and without subversion by feminist doctrine, and therefore enter upon motherhood with a sense of fulfilment and altruistic sentiment, we shall attain the goal of a good life and a secure world in which to live it.*" and from Bruno Bettelheim, writing on "The Commitment Required of a Woman entering a Scientific Profession in Present Day American Society" in an MIT Symposium on American Women in Science and Engineering": "*We must start with the realisation that, as much as women want to be good scientists or engineers, they want first and foremost to be womanly companions of men and to be mothers.*

These assumptions came to be supported by reference to brain differences. The argument goes like this. As part of their different biology, women must have brains that are different from men's. You are what your brain can do, and if your brain can't do tricky things like running a country, designing a bridge, starting a war, you shouldn't try and society shouldn't let you.

Earlier research in this field is downright misogynist – 19th century neurologists cheerily matched their assumptions about which bit of the brain was the most important to their findings of which bits of the brain were largest in males, even if it meant reversing earlier conclusions. Having scoffed at the extensive parietal lobes in females when it was clear that the frontal lobes were 'the repository of highest mental capacities', during a brief fashion for identifying the parietal lobes as the seat of human intellect, neurologists had to quickly back-pedal and report that females actually had larger frontal areas after all.

You would hope that in the age of dramatic advances in brain sciences we might have moved on from such simplistic dichotomies, that our research into the brain would have risen above irrelevant issues such as the sex



of its owner. A quick Amazon search would dash these hopes.

Perhaps we should look on these texts as genuine self-help/self-awareness manuals, as providing scientifically based insights into why we are who we are, and why we shouldn't try to be anything different.

Should we just accept that men's and women's brain **are** different and child-rearing, education, social policy decisions should be based on this fundamental fact? Or are we being misled by 'neurononsense'? How would we know? Here are some questions we can ask to come up with an answer.

Dichotomising Differences.

Firstly – what do we mean by different? Are all men different from all women? This would certainly be the message that you would get from 'Neurotrash' texts, with all little girls cuddling their toy fire-engines and all little boys smashing them into walls. I call this 'Dichotomising differences' But if we look more carefully into any research talking about behavioural differences between males and females it is clear that these differences are very small and (more importantly) the distributions of any kind of performance scores are overlapping. There may be more men than women in the higher echelons of mathematics, but there are equally large numbers of women who outperform their male counterparts.

Sustaining Stereotypes

An adjunct to Dichotomising Differences is that researchers can 'sustain stereotypes' by asking their questions in terms of such stereotypes and reporting their findings in these terms. Take the difference between a preference for 'rule-based' activities and a preference for 'nurturing-type activities'. There is a greater tendency among boys to prefer the former and for girls the latter. Research into the 'brain basis' for this could be reported as in terms of 'empathic' brains' and 'systemising' brains, especially in any test to measure this behaviour, not all females are empathisers and not all males are systemisers. But no, a swift glance through not only populist literature but also more supposedly rigorous scientific texts will show this difference being reported in terms of 'male brains' vs. 'female brains'. And this can lead to the kind of statements we can find on websites such as 'BrainSex Matters' (<http://www.brainsexmatters.com>) *"Conclusive scientific research presents an*

irrefutable truth: The difference between men and women is not merely physical. It is neurological, too. Male and female human brains are wired differently, causing us to think, feel, react and respond in strikingly different ways”.

Another aspect of this is where researchers load their findings by devising their questions in terms of pre-existing stereotypes. In research into effects of the menstrual cycle on behaviour, participants are asked to fill in a ‘menstrual distress questionnaire’. There is no sign of an ‘ovulation euphoria’ questionnaire! In follow-up studies of girls who were exposed to high levels of testosterone before birth, they were rated on measures of ‘masculine’ behaviour. These measures are, for example, whether or not these girls ‘liked climbing trees’ or were ‘interested in marriage’. When stereotypes inform the research design, it is not surprising that the research outcomes can sustain the stereotypes.

These first 2 problems can apply to much psychological research – biology/brain research (or more particularly its reporting) has additional traps into which it can fall.

Humanising Animal Research.

Any good scientific research needs to be run under well-controlled conditions, which limit unwanted variance and allow researchers to manipulate the variables they are interested in. If you are interested in the link between biology and behaviour in fruit flies, or zebra fish or mice the problem is solved. If you want to ask questions about human brains or human behaviour, it may still be easier to use non-humans and work in your laboratory. But all too often the findings can ‘go astray’ and you can suddenly find that work on sex differences in zebra fish are being quoted to support assertions about sex differences in human brains. For example, a researcher may be interested in how baby chicks learn to peck at grain. Hypothesising that the organisation of their brains has a role to play in this, this may be manipulated by playing around with hormone levels or perhaps something more

invasive. Perhaps the finding is that higher levels of male hormone make baby chicks better grain peckers. But this finding can then enter the ether as ‘proof’ that (human) males have superior-visuospatial skills due to their higher testosterone levels. This will therefore make them better artists, architects, navigators, aviators etc. The titles scientists (innocently) give their papers can be misleading too. A paper in Neuroscience (2009): ‘Neurochemical and Behavioural Alterations in an Inflammatory Model of Depression: Sex Differences Exposed’ is actually about rats and the model of depression used involves rat behaviour in activities such as ‘forced swim’ and ‘hotplate’ tests. It would not take long for the ‘Chinese Whispers’ effect to find such research as explaining human sex differences in clinical depression; indeed animal researchers may justify their findings (and their funding) by indicating that their animal based research can be applied in the human sphere.

This type of misreporting I like to call ‘brain bloopers, where ill-informed, wilfully ignorant or perhaps just lazy authors don’t bother to check their sources and will assert scientific support for their model of human male/female differences which is actually based in research in zebra fish or rats. A good example of this is a book ‘The Female Brain’ by Louann Brizendine which has been the subject of a thorough filleting on Mark Liberman’s ‘Language Log’ : <http://languagelog.ldc.upenn.edu/nll> but as we shall see later, sells well and has an enthusiastic following.

‘Neurohype’

There are 2 aspects to this problem. The first is what is known as ‘the seductive allure of neuroscience’. Research has shown that using the prefix ‘neuro-’ in front of explanations (even ones that have been identified as bad explanations) can make people much more likely to rate such explanations as acceptable. So asserting (absolute) differences between men and women as based on research with the term ‘neuro-’ in it is much more likely to be taken

as gospel. It is also used to lend credibility to or rebrand areas of research which are looking for a bit of hype – we have ‘neuromarketing’, ‘neurosemantics’, ‘neuroeconomics’ It is even being used to market soft drinks – look out for Neurobliss, Neurosport and (don’t ask) Neurogasm!

The second aspect of ‘neurohype’ is a fundamental misunderstanding of what those wonderfully coloured images of brain activity, brain cells and brain pathways are actually telling us. One problem is known in the trade as ‘the reverse inference’ problem. You can collect measures of brain activity of people indulging in any almost any kind of human behaviour and, following very lengthy and complex analysis paths (involving all sorts of averaging and thresholding and assumptions about where signals are coming from , can generate deceptively clear images showing different areas of the brain ‘coloured coded’ to show different levels of activity. You can then identify those brain areas or brain networks that are normally involved when that particular type of behaviour is occurring. What you can’t reliably do is reverse the process, to look at an unnamed, unlabelled brain image and identify what the person was doing when that image was generated. You can’t look at a brain image and say that is the brain of a man trying to solve a crossword puzzle, or that is the brain of a woman trying to read a map, or a little girl looking after a doll. But all too often this is the impression that our ‘neurotrash’ authors will give us.

Misguided Research

All of these problems can be found in what I would call misguided research, where researchers reach the pinnacle of neurononsense, both because of their own prejudices and because of the media mangling they can expose themselves too. As example of this is found in the history of a report at the American Association for the Advancement of Science on Feb. 15th 2009 (thanks to <http://neurocritic.blogspot.com>

for helping me track this). Susan T. Fiske was reporting on the ‘Neural and Emotional Signatures of Social Hierarchies’. This involved showing male participants being brain-imaged while being shown pictures of different males or females in different levels of dress (fully clothed, partially clothed, in swimwear) and then asking them to identify which ones they had seen before. The males remembered the bikini-clad women the best. The authors reported “... areas of the brain that normally light up in anticipation of using tools, *like spanners and screwdrivers*, (own emphasis) were activated....The changes in brain activity suggest sexy images can shift the way men perceive women, turning them from people to interact with, to objects to act upon”.

Within days, the findings were either being reported more or less accurately but with images giving a different spin:

- [Ian Sample](#), Chicago
- guardian.co.uk, Monday 16 February
- **Sex objects: Pictures shift men's view of women**
- **Researchers used brain scans to show that when straight men looked at pictures of women in bikinis, areas of the brain that normally light up in anticipation of using tools, like spanners and screwdrivers, were activated.**



Or they had gone beyond the findings reported as well as re-illustrating the conclusions.

Men see bikini-clad women as objects, psychologists say

STORY HIGHLIGHTS

- Men: Brain areas linked w
- They also remember thes
- Future research could loo

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By Elizabeth Landau
CNN

TEXT SIZE

CHICAGO, Illinois (CNN) – It may seem obvious that men perceive women in sexy bathing suits as objects, but now there's science to back it up.



GETTY IMAGES

Images of women in bikinis prompted brain responses in men associated with using tools.

New research shows that, in men, the brain areas associated with handling tools and the intention to perform actions light up when viewing images of women in bikinis.

The research was presented this week by Susan Fiske, professor of psychology at Princeton University, at the annual meeting of the American Association for the Advancement of Science.

"This is just the first study which was focused on the idea that men of a certain age view sex as a highly desirable goal, and if you present them with a provocative woman, then that will tend to prime goal-related responses," she told CNN.

Although consistent with conventional wisdom, the way that men may depersonalize sexual images of women is not entirely something they control. In fact, it's a byproduct of human evolution, experts say. The first male humans had an incentive to seek fertile women as the means of spreading their genes.

National Geographic News, Reporting Your World Daily: Monday Feb. 16th, 2009

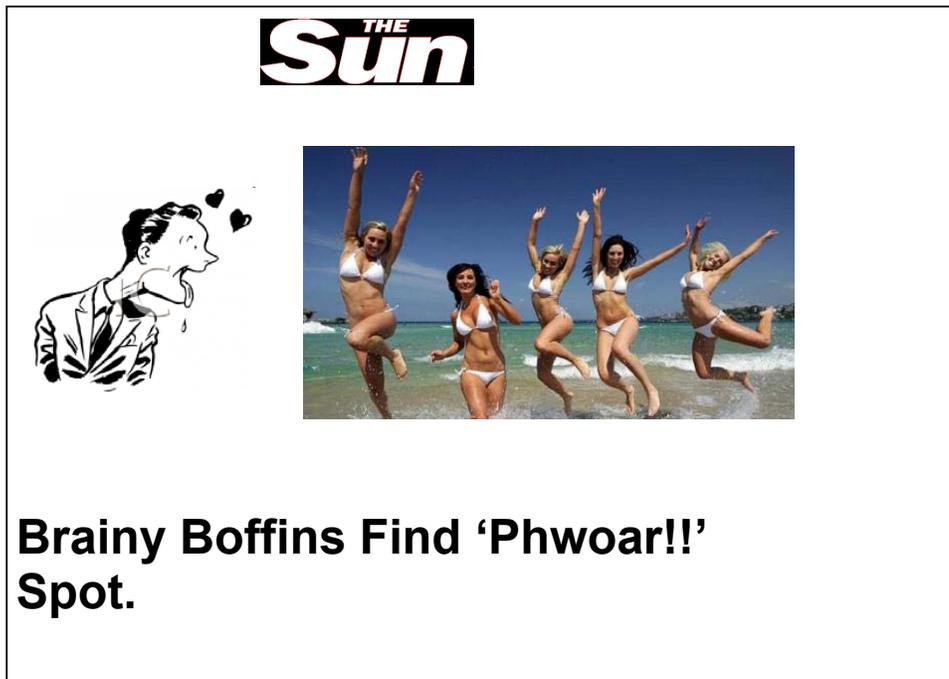
■ **Bikinis Make Men See Women as Objects, Scans Confirm**

- Brain scans reveal that when heterosexual men are shown pictures of scantily clad women, the region of the brain associated with tool use lights up.

Men were also more likely to associate images of sexualized women with first-person action verbs such as "I push, I grasp, I handle," researchers said in February 2009



Or even:



OK I made that one up, although the picture *was* used to illustrate yet another version!

You may feel it is a little unfair to single out an unfortunate neuroscientist who has innocently got misreported in the press. A quote from this author being interviewed about her work might change your mind: "We predicted these results – that there would be activation in the tool-use part of the brain [when the men viewed half-naked women] – before the study, Fiske said. I remember Jennifer [Eberhardt] suggested it first about a year ago, and I said "Oh, Jennifer, that's disgusting I can't believe you're predicting that."

So we haven't moved on as much as we should since Helen Woolley was writing 100 years ago. Should we care? Is this just a straw man that makes an easy target that we can smirk at or wince at, depending on how ridiculous the neurononsense is?

One concern I have is that 'neurotrash' sells. Louann Brizendine's book, full of bloopers as it is, has been translated into many different languages. She has her own website: <http://www.louannbrizendine.com/> carrying quotes such as; "I found I could change the conversation at any social gathering by mentioning Louann's book: The Female Brain" -and her book has its own Facebook page. Much of what she has misquoted is being accepted as scientific truth and used to inform life-style choices and even clinical treatment.

Neurononsense can also get quoted in support of policy making. In 2008, Vicky Tuck, then headmistress of Cheltenham Ladies College, was quoted as saying single-sex schools should make a comeback as boys' brains work differently to girls.

Additionally: *“Well, take maths. If you look at the girls they sort of approach maths through the cerebral cortex, which means that to get them going you really need to sort of paint a picture, put it in context, relate it to the real world, while boys sort of approach maths through the hippocampus, therefore they're very happy and interested in the core properties of numbers and can sort of dive straight in.”*

Look out, then, for neurotrash. Is this latest book or article on sex differences (or indeed anything to do with the brain) a product of neurononsense? Have they been seduced by the power of “Neuro-.....”? Have they fallen into the Reverse Inference trap? Are they Dichotomising differences? Are they Sustaining Stereotypes? Are they Humanising animal research? Are they, indeed, full of *“flagrant personal bias, logic martyred in the cause of supporting a prejudice, unfounded assertions, and even sentimental rot and drivel”*?



Brain Differences should not be inflated

Gina Rippon, Professor of Cognitive NeuroImaging, Aston Brain Centre, Aston University, Birmingham.