

# Louis Gifford – revolutionary: the Mature Organism Model, an embodied cognitive perspective of pain



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**I am honoured to write a paper for *In Touch* in tribute to Louis Gifford.**

**Louis was a fantastic supporter of this journal, publishing several seminal papers here that he could have sent elsewhere for publication, demonstrating his commitment to making his ideas freely available to those who were in the same clinical setting as himself – private practice.**



There is much that I could say about Louis and I am fortunate to have had the opportunity elsewhere (see <http://giffordsachesandpains.com/2014/02/> and [www.csp.org.uk/news/2014/10/13/physio-14-speakers-praise-work-louis-gifford-pain-management-pioneer](http://www.csp.org.uk/news/2014/10/13/physio-14-speakers-praise-work-louis-gifford-pain-management-pioneer)).

I want this account to be about Louis' ongoing contribution to our understanding of pain and to demonstrate that his ideas will continue to have impact for many years to come. I have had the pleasure of working directly with several "greats" in the world of pain, most notably Professor Pat Wall and Professor Steve McMahon. What they had/have and Louis shared, was the ability to see way into the future developments of pain research and somehow get their finger on a pulse that hadn't yet started.

I could have detailed any one of the many original ideas that Louis proposed, but have decided to concentrate here on the one for which he is best known, the Mature Organism Model (MOM). I am on record as a fan of the MOM, not as someone who glibly accepts what it is, but of what motivated it, what it became and, the main focus of this manuscript, where I believe it is going. It was the driving force behind the physiotherapy "pain revolution" and continues to have massive relevance and influence.

Rather than giving an exhaustive description of the MOM in this article, I would instead urge you to purchase a copy of Louis' books *Aches and Pains* and read the extensive account of the

MOM from the man himself. What I will do here is give a brief summary that demonstrates the key themes of the MOM by acknowledging it as a systems-based approach to pain and proposing how it relates to current ideas that, although in their infancy, are likely to dominate our understanding of pain over the next 10 years.

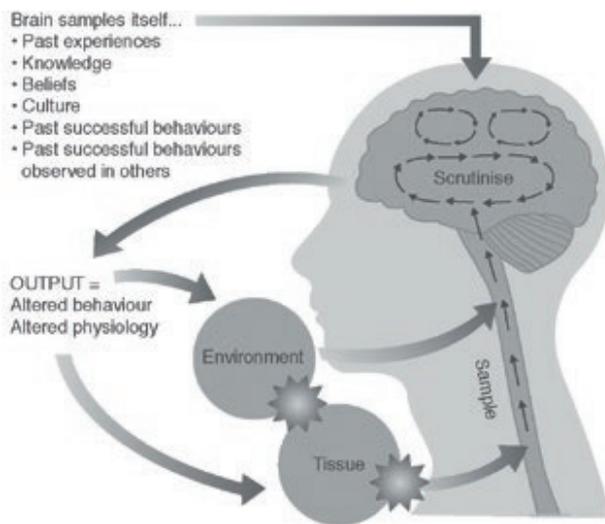
This account is heavily philosophical and I make no apology for that; I, together with others (Thacker & Moseley 2012, Edwards *et al* 2014), am on record as promoting the inclusion of philosophical perspectives and reasoning into physiotherapy and the management of individuals in pain. I think the MOM was/is hugely philosophical, but in an applied way making it consistent with current directions within the cognitive neurosciences.

When I first saw the MOM back in 1998 (figure 1), I recognised its importance and influences immediately; it incorporated the biology (and atheism) of Dawkins and Jones together with the ethology of Lorenz, Tinbergen and von Frisch (Louis was, after all, a card carrying zoologist!); the Neural Matrix perspective of Melzack; action orientated construct (need state) proposed by Wall and the stress biology of Selye and Sapolsky, not to mention the neurophilosophy of Varela, Rosch and Thompson. Wow!

The enormous scope of these influences was immediately obvious, and impressive, to any reader with an appreciation of science in general, and specifically the pain sciences. To bring

together viewpoints that were thought by many to be mutually exclusive was an incredible achievement and it did so without recourse to dualistic and behaviourist models of pain, which dominated thinking at the time. This is what Pat Wall said reviewing *Topical Issues in Pain 1*:

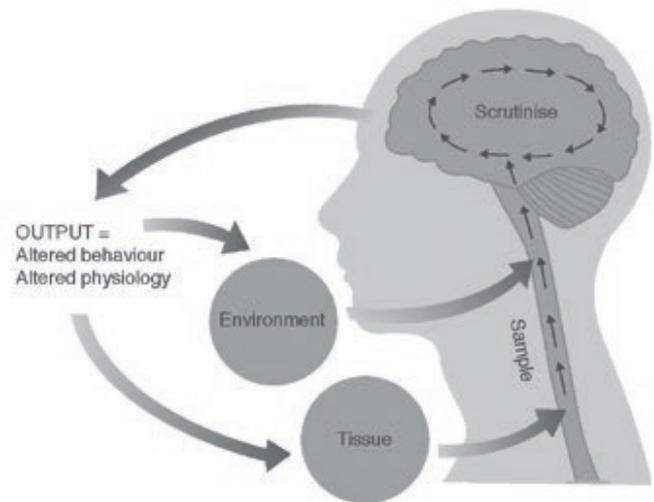
*"I was particularly impressed by the chapter by Gifford on the 'Mature Organism Model' which places pain in an integrated context without any permission to accept the old dualistic split that pain be either in the body or in the mind".*



**Figure 1: The Mature Organism Model: this is a re-drawing of the original. Note that sampling is not just of peripheral sensory inputs, but also thoughts, feelings and behaviours. The scrutinising of these inputs are influenced by socio-cultural influences. Reproduced with permission, CNS Press, Falmouth**

Louis had two main objectives. The first was to put an end to the behaviourists' black box, where inputs determine set outputs in a predictable and consistent manner. Second, to overcome the dualistic perspective of many therapists who based their practice purely on tissue based paradigms. He incorporated the whole of the nervous system and "output" systems, i.e. immune, endocrine, sympathetic nervous system, motor and, in doing so, he challenged the guru driven culture that had taken over the management of pain in physiotherapy. These gurus had made their name and, in some cases, considerable financial gain by focusing on individual treatment approaches targeted at specific anatomical structure, e.g. McKenzie–disc, Maitland–joints, Janda–muscles. The MOM dealt with the sampling (input), scrutinising, and response (output systems) as a continuum offering a model that facilitated a freedom of where to direct treatment and liberation from purely peripheral thinking.

Importantly, Louis developed an approach consistent with the systems based hierarchy, inherent within the MOM, based on a "top down before bottom up" perspective. He realised that many of the lower level processes are directly influenced from those hierarchically "higher" and that failure to prepare or co-opt/inform these would reduce or negate the potency and efficacy of treatments. This effectively ripped open the black box!



**Figure 2: The Mature Organism basic framework: not only is the "organism" sampling its own body, but also its environment. Similarly "outputs" or responses are not just alterations in physiology, but also in behaviours. The outputs involve the activity of associated systems including the motor, sympathetic, immune and endocrine systems. Reproduced with permission, CNS Press, Falmouth**

One of the main advantages of the model was that it placed equal emphasis on all the components of the nervous system and introduced the dynamic interplay of the nervous system with other systems, including the motor, sympathetic, immune and endocrine systems, and while explicitly suggesting they were outputs, i.e. responses, the model implied they could become "inputs" in their own right. This was inspired and liberated thinking (figure 2).

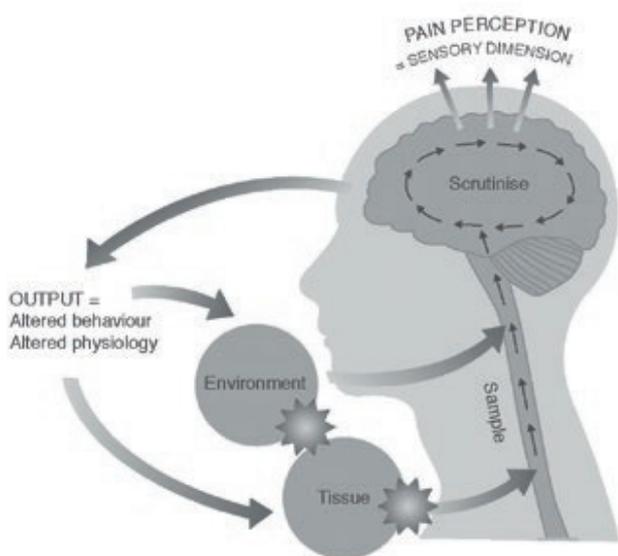
This thinking helped strengthen my own thoughts and encouraged me to pursue my interest in the role of neuro-immune interactions in the generation and maintenance of pain, at the time not a field considered worthy of serious study. Here was a great example of Louis being well before his time; the MOM suggested that there was a role of the immune system in pain not merely in response to tissue damage but also during nociceptive processing. There is now a massive body of work (McMahon *et al* 2005; Marchand *et al* 2007; Scholz & Woolf 2007; Thacker *et al* 2007) that has confirmed that the neuro-immune interactions are critical in the development and maintenance of pain. Importantly, Louis hypothesised that these interactions are also operational in non-pain states, i.e. during homeostasis and development; and we now know that they are. There is now an extensive literature base to support a role for all the "output systems" suggested by Louis in the MOM (Hodges & Moseley 2003; Tennant 2013; Janig & Levine 2013). I believe this reveals the potency of the MOM as a model of pain (and homeostasis); it has facilitated novel avenues for research and has been able to incorporate subsequent research findings without losing its construct validity.

During the process of writing *Aches and Pains*, Louis and I engaged in many long conversations about our understanding of pain and the potential influences of current perspectives and their pertinence to managing patients in the clinic. He was interested, as always, in what I was up to in terms of reading and

idea development and their impact, or not, on the construct of the MOM and wider understanding of pain.

I sent him a copy of Alva Noë's book *Out of Our Heads: Why you are not your brain and other lessons from the biology of consciousness* and proposed to Louis that much of what Noë was saying was essentially incorporated in the MOM. Alva Noë is a world-renowned American philosopher who has proposed a sensorimotor understanding of perception and consciousness within an embodied construct. Put simply, he believes that consciousness is "something we do" rather than something that happens inside us. As ever Louis requested more reading material, yet sadly he was unable to get round to reading it.

What I was suggesting to Louis was that the MOM is inherently a model of the embodied cognition of pain (figure 3). Embodied Cognition (EC) is a rapidly advancing theory (in reality a group of theories) that has become the focus of some of the world's leading neuroscientists (Friston, Edelman, Damasio), cognitive scientists (Lakoff, Johnson, Nunez), philosophers (Clark, Noë, Thompson, Gallagher, Zahavi, Hohwy) and those from the robotics and artificial intelligence communities (Brooks, Hinton, Pfeifer).



**Figure 3: Pain perception is not just a function of the brain but of the whole body and its interactions with the environment. The MOM is essentially a model of the embodied cognition of pain. Reproduced with permission, CNS Press, Falmouth**

Embodied Cognition holds that an agent's (person's) cognition (incorporating thoughts and feelings) is deeply dependent upon features of their physical body; that is, when aspects of the agent's body beyond the brain play a significant causal or physically constitutive role in cognitive processing.

I suggest that EC offers a better understanding of pain than other concepts as it sees the person as a whole without separation of the body from the brain/mind and acknowledges that people enact with, and shape their environments. Look again at figures 1-3 and now read the following quote from Varela *et al* (1993):

*"By using the term embodied we mean to highlight two points: first that cognition depends upon the kinds of experience that come from having a body with various sensorimotor capacities, and second, that these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological and cultural context."*

I hope you agree that there isn't anything missing from the MOM in regards to EC (although I wish the diagrams represented the whole body not just the upper torso, cord and brain). While the MOM considers pain as a conscious event requiring a brain, it describes a dynamic interplay and interconnectedness between the person and their environment via the body as a whole, therefore damage, threat and stress affect the whole person, referred to by Louis as the "vulnerable organism"; consistent with EC it is not just a "brain thing".

EC is now at the centre of revolutionary work that attempts to substantially increase our understanding of human perception/experience and consciousness, and is likely to remain so for the next 10-20 years. Just think; Louis had incorporated all the central tenets of EC in the MOM. He clearly had his finger on the pulse of 2015, and maybe even 2025, way back in 1998!

EC is at odds with the traditional view of consciousness as a product of only the brain. This traditional view allowed the perspectives that people are their brain and that all pain "is in the brain". I discussed these perspectives at length with Louis and they became a constant in our discussions while I helped proofread and edit *Aches and Pains*. I am a passionate advocate against these perspectives. My position, entirely consistent with MOM/EC, is that humans are fully embodied, i.e. that it is people who have brains and it is people who have arms, legs, livers, heart, lungs, sciatic nerves, cruciate ligaments, gluteal muscles etc., etc. I have never clinically told or wanted to tell a patient that their pain was in their brain; if you have, what was the result? How does it make them feel if you make them believe that they are their brain and all pain is in the brain?

I suggest the outcome is a loss of personal empowerment, frustration and anger! I propose that a full understanding of the principles of the MOM/EC helps prevent fallacious reasoning of this kind. The MOM/EC acknowledge the importance of brains, but negate their primacy. Louis got 'it' straight away and reworked several of his chapters to reflect this perspective. I wish we had had more time to discuss and explore these topics in relation to where the MOM was/is heading.

Some proponents of EC have infused phenomenology into their thinking. Phenomenology is the study of structures of consciousness as experienced from the first-person point of view. Simply put, it is about how something feels to the person himself or herself. Together the fusion of EC and phenomenology led to the development of enactivism, which argues that cognition / conscious perception arises through a dynamic interaction between an acting organism and its environment. A central tenet is that we are not only shaped by our environments, but also shape them and that, in turn, has a direct effect on how we think and feel. Unsurprisingly, as an EC

model of pain, the MOM is easily able to incorporate this way of thinking; look again at figures 1-3, it's all there!

An essential component of an enactivist approach in clinical practice involves allowing the patient the freedom, time and environment to express their thoughts, feelings, perceptions and experiences, and encouragement to find self-motivated novel strategies to understand and manage their pain. Anyone lucky enough to have listened to Louis over the years would have got the message: listen to the patient; understand how they feel and think; watch them move and interact with their environment; make them feel special and then get them to do things in a way they are able to, and want to (accepting sometimes they themselves don't know what that is).

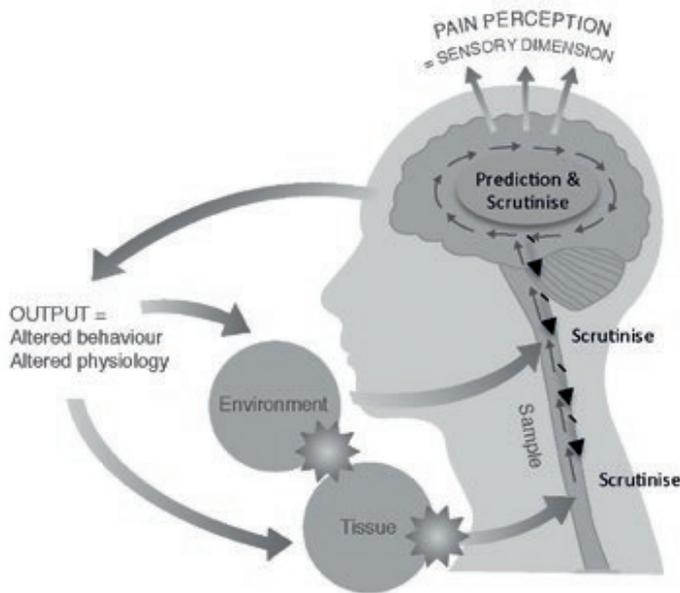
This way of thinking is ultimately about agency; agency is the capacity of a person to act in any given environment. Importantly, agency allows us to determine and control our "life worlds"; the subjective experiences we choose to encounter. What we all want is full agency, i.e. freedom of choice to do what we want when we want, although society and culture limits this to varying degrees depending on the socio-political conditions. In terms of health, we expect to have full agency, but illness, and especially pain, have direct and deleterious effects on this. Patients often report a loss of agency, manifested as limitations in activities of ADL, sport and hobbies. Often with persistent pain, agency is absent on the part of the individual and they report that pain has agency over them: "it tells me what I can and can't do or when I am allowed to do it". Thus outputs are not just about physiological mechanisms, but also perceptions, thoughts and behaviours. I believe that this is a unique component of the MOM and an important consideration for practice. Louis suggested our reasoning and management strategies have to consider all potential components in order to be clinically effective (see the chapters on the 'Shopping Basket Approach' in *Aches and Pains*).

The subtlety of some of the messages in the MOM is easily overlooked. Pat Wall heavily influenced Louis, but to some degree the MOM (1998) pre-empted many of the messages in Pat's book *Pain: The Science of Suffering* (published 1999). Pat had a clear objective to alter the perspective of pain as a purely sensory experience and rather to see it in terms of integrated, action orientated phenomena. A more simple way of understanding this paradigm is to think of it in terms of a "need state" that promotes a co-ordinated and multi-system "strategy which generates our sense of ease or distress". I still think this is a message largely unheeded by many who manage pain. Louis had incorporated this into the MOM and much of his teaching. He realised that many of the antalgic posture and strategies employed by patients were, in fact, understandable attempts to promote relief. He was one of the few people not to advocate correcting an acute side shift, preferring instead to leave it in place and to work on pain relief strategies including advice, support and education until it naturally started to resolve. I believe this ethos is very much in tune with a number of developing approaches used to manage pain, for example Acceptance and Commitment Therapy / mindfulness, where there is no need to effect an immediate reduction in symptoms.

The concept of pain as a need state has recently caught the attention of philosophers, most notably Colin Klein who suggests that pain is an imperative sensation. Here, sensation is used differently to the classic definition. Imperative sensations such as thirst, hunger, tiredness and pain do not describe or represent how the world is, but rather they are requirements to act; in the case of pain, to do something in an attempt at relief. Furthermore, imperatives are not representational; they do not mean that something definable is happening where the pain is felt. Louis was promoting this perspective when attempting to move people away from simplistic deductions about aches and pains in the clinic. He was a critic of many manual therapy paradigms that were based on peripheralistic thinking, including diagnostic "tissue responses" to clinical testing. Imperative sensations demand that we take action to relieve them. The "exactness" of the action is not thought to be important, rather that the action is "considered" an appropriate response to the experience. This was and remains a liberating perspective, although it is far from a license to do what you want with people! Rather it urges the therapist to find the right strategy for that individual, it promotes individualised care which is considered a desirable goal within the pain management community and is at the forefront of modern healthcare strategies. What is important is that Louis wasn't trying to be ahead of his time or be an armchair philosopher, he just was. It emerged from his deep understanding and thinking about the biology of aches and pains.

Finally, I would like to return to Louis' insistence on "top down before bottom up" as my last example of him being way ahead of his time. Perhaps the hottest topic in the cognitive neurosciences at present is the concept of Predictive Coding (PC) (Friston 2010, Hohwy 2013 and Clark 2014). The tenet of PC is that the nervous system is hierarchically organised and generative. That is, higher levels of the system predict the activity of lower levels and use afferent information to modify these predictions. The key here is that there is a constant interaction between prediction and actual events, but that the higher levels are operating a constant "output" to the lower levels. The scrutinising of inputs occurs at all levels of the nervous system. However, what ascends to higher levels are error signals between the prediction and inputs. Louis readily acknowledged that the scrutinising of sensory information was not confined to the brain. Mismatches or errors between the prediction and sensory inputs lead to a remodelling of the predictive outputs at higher levels. This continues until the predictions and inputs are matched and this process of error cancellation at the highest levels of the nervous system is thought to result in perceptual awareness (figure 4).

While Louis followed the conventional perspective that somatosensory processing begins with some type of input, which is then scrutinised and, in turn, produces a relevant output, I believe that the MOM is easily able to incorporate the newer construct of prediction first. Note that the central theme of PC is top down before bottom up, I believe that Louis' desire to bring "the conscious brain firmly and centrally into our understanding of pain" was what led him to say this and is highly consistent with the PC theory of perception. This is something I would have loved



**Figure 4: A small conceptual shift easily aligns the MOM with the concept of predictive coding. Here, higher levels of the nervous system continuously “output” predictions (solid downward arrows) of the activity of lower levels of the nervous system. Scrutinising the differences between inputs and predictions occurs at all levels of the nervous system and results in the upward flow of error signals (ascending arrows). These error signals update the prediction until there are no more errors – resulting in the perception of pain. Modified with permission, CNS Press, Falmouth**

to spend the next few years discussing with him, especially as it is the basis for my own ongoing research agenda.

The leading figures in PC have suggested predictive models are the result of previous experiences encountered throughout an individual’s development and beyond. Look again at figure 1. Louis named the MOM intentionally to reflect these principles, that the individual gathers new experiences as they mature from the infant through adolescence to adulthood, i.e. they mature. It is easy to understand from the MOM that experiences, together with cultural and societal influences, shape and modify top down predictive models; Louis always saw these factors as ongoing inputs which update and inform the nervous system, in PC theory they are thought to modify and inform the construction of the predictive “outputs”. I hope you can see that it requires only a small conceptual shift in the MOM to get to PC!

In conclusion, I hope that I have adequately reflected Louis’ thinking and demonstrated what a truly original and brilliant thinker he was. His ideas remain years ahead of their time. I have used the MOM as a model of pain since its inception; the more I learn and attempt to assimilate knowledge from my own and wider research, the greater I gain appreciation of its impact, validity and longevity.

I am privileged that I had the opportunity to question, contest and discuss with Louis his ideas first hand. He was my colleague,

mentor and friend. I loved him dearly and miss him more than words can say. Of course, I am not alone in these sentiments, he was a dear friend to many of you, too, and the profession has lost one of its true greats. It delights me to be able to say that both the man and his ideas will not be forgotten easily and I know that would have made him very happy.

## About the author

Mick qualified in 1987. He has a MSc from University College London and a PhD in pain neuroscience from King’s College London. Mick has worked with some of the world’s leading experts in pain including Professors Patrick Wall and Steve McMahon. He first got to know Louis Gifford via the Physiotherapy Pain Association and they became colleagues and great friends. He works jointly at King’s College London as a lecturer and Guy’s and St Thomas’ Hospital as a Senior Consultant Physiotherapist. Mick was awarded a Fellowship of the Chartered Society for his expertise of the neuroscience of pain and how it relates to the clinic.

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## References and further reading

In the spirit of Louis, this list not only contains cited references but also material I think the reader may find interesting if they wanted to explore the topics introduced here in more depth.

- Clark A. *Supersizing the Mind: Embodiment, Action, and Cognitive Extension*. Oxford University Press, Oxford 2008
- Clark A. *Mindware: An Introduction to the Philosophy of Cognitive Science*. Oxford University Press, Oxford 2014
- Clark A. Whatever Next? Predictive Brains, Situated Agents, and the Future of Cognitive Science. *Behavioural and Brain Science* 2013;36(3):181-204
- Damasio A. *Descartes’ Error: Emotion, Reason and the Human Brain*. Vintage, London 2006
- Dawkins R. *The Selfish Gene: 30th Anniversary edition*. Oxford University Press, Oxford 2006
- Edelman GM. *Neural Darwinism: Theory of Neuronal Group Selection*. Basic Books, New York 1987
- Edwards I, Jones M, Thacker MA, Swisher LJ. The moral experience of the patient with chronic pain: bridging the gap between first and third person ethics. *Pain Medicine* 2014;13:123-23
- Friston K. The free-energy principle: a unified brain theory? *Nature Reviews Neuroscience* 2010;11(2):127-38
- Gallagher S, Zahavi D. *The Phenomenological Mind*. Taylor Francis, London 2012
- Gifford LS. *Aches and Pains*. CNS Press, Falmouth 2014
- Hodges PW, Moseley GL. *Pain and motor control of the lumbopelvic*

region: effect and possible mechanisms. *Electromyography and Kinesiology* 2003;13(4):361-70

Hohwy J. *The Predictive Mind*. Oxford University Press 2013

Janig W, Levine JD. Autonomic, Endocrine, and Immune interactions in acute and chronic pain. In: McMahon SB, Koltzenburg M, Tracey I, Turk D. (eds.) *Wall and Melzack's Textbook of Pain*. Elsevier, London 2013

Jones S. *The Language of the Genes*. Flamingo, London 2000

Klein C. An imperative theory of pain. *The Journal of Philosophy* 2007;104(10):517-532

Klein C. Imperatives, phantom pains, and hallucination by presupposition. *Philosophical Psychology* 2012;25(6):917-928

Lakoff G, Johnson M. *Metaphors We Live By*. University of Chicago Press, Chicago 1981

Marchand FI, Perretti M, McMahon SB. Role of the immune system in chronic pain. *Nature Reviews Neuroscience* 2005;6(7):521-32

McMahon SB, Cafferty WBJ, Marchand F. Immune and glial cell factors as pain mediators and modulators. *Experimental Neurology* 2005;192(20):444-462

Melzack R. Phantom limbs and the concept of a neuromatrix. *Trends in Neuroscience* 1990;13(3):88-92

Noë A. *Out of Our Heads: Why you are not your brain and other lessons from the biology of consciousness*. Hill and Wang, New York 2010

Pfeifer R, Bongard J. *How the Body Shapes the Way We Think: a new view of intelligence*. MIT Press, Cambridge, MA 2006

Scholz J, Woolf CJ. The neuropathic pain triad: neurons, immune cells and glia. *Nature Neuroscience* 2007;10(11):1361-8

Sapolsky R. *Why Zebras Don't Get Ulcers: Guide to Stress, Stress-related Diseases and Coping*. WH Freeman & Co Ltd, New York 1998

Selye H. *The Stress of Life*. McGraw-Hill, New York 1978

Tennant F. The physiologic effects of pain on the endocrine system. *Pain Therapy* 2013;2(2):75-86

Thacker MA, Clark A, Marchand F, McMahon SB. The role of immune cells in peripheral neuropathic pain. *Anaesthesia and Analgesia* 2007;105(3):838-847.

Thacker MA, Clark AK, Bishop T, Grist J, Yip PK, Moon DF, Thompson SWN, Marchand F, McMahon SB. CCL2 is a key mediator of microglia activation in neuropathic pain states. *European Journal of Pain* 2009;13:263-272

Thacker MA, Moseley GL. First person neuroscience and the understanding of pain. *Medical Journal of Australia* 2012;196(6):410-411

Thompson E. *Mind in Life*. Harvard University Press, Cambridge, MA 2010

Varela FJ, Thompson E, Rosch E. *The Embodied Mind: Cognitive Science and Human Experience*. MIT Press, Cambridge, MA 1993

Wall PD. *Pain: The Science of Suffering*. Widenfield and Nicholson, London 1999



**Mick Thacker** will present the **PPA Louis Gifford Lecture** at **Physiotherapy UK 2015**, on **Friday 16 October**, at the **BT Convention Centre in Liverpool**.

The lecture starts at 5:30pm and is open to all PPA members. For those who wish just to attend the Louis Gifford Lecture, the cost will be £5.

For further details go to the PPA website [www.ppa.csp.org.uk](http://www.ppa.csp.org.uk)