

# Interpersonal Neurobiology as a Lens into the Development of Wellbeing and Resilience

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This article reviews the interdisciplinary field of interpersonal neurobiology and its view of developmental trauma and wellbeing. Issues related to the mind, brain and relationships are discussed along with a working definition of both the mind and mental health.

■ **Keywords:** mind, relationships, attachment, development, brain

It is an honour to offer a summary of an interdisciplinary field that combines a wide array of the branches of science into one framework to explore the nature of being human. Interpersonal neurobiology was born in the early 1990s, the Decade of the Brain in the United States, to explore how we might best utilise the findings from the spectrum of rigorous academic fields focusing on the human condition, from our minds and relationships to challenges to our mental, medical, social and planetary wellbeing. The first book to explore this approach, *The developing mind* (Siegel, 1999/2012), invited the reader to consider how we might see the ‘whole elephant’ view of human reality – linking perspectives from math and physics to those of biology, psychology and anthropology. Since that time, the fields of the humanities, religion, contemplative studies, education, parenting, mental health practice and ecology have become a part of this mission.

This ‘mission’ is essentially to bring science to life. We integrate the various sciences and then we translate their findings into practical applications with the aim of helping people’s lives.

We take the hard-earned findings from distinct disciplined approaches to exploring reality and find the universal findings, or ‘consilience’ (an old English term brought back into modern usage by E.O. Wilson in his book by that name (Wilson, 1998)), among usually independent pursuits of knowledge. As of this writing, we have in our professional series with WW Norton over 40 published textbooks that take broad scientific findings and apply them to improve human life and promote wellbeing. I am proud to work alongside my colleagues in the continued creation of this library of professional works.

Interpersonal neurobiology, often abbreviated as IPNB, has some fundamental principles that emerge from this search for consilience and practical applications. In this article I’ll share some of these basic ideas and explore how they can be used to both understand life more deeply and intervene with more specificity to face our various challenges with more strength and resilience.

## Some Basic Principles of Interpersonal Neurobiology

1. IPNB addresses three fundamental aspects of life, relationships, brain and mind:
  - (a) **Relationships** are the sharing of energy and information flow.
  - (b) The **‘brain’** or the ‘embodied brain’ is the embodied mechanism of energy and information flow.
  - (c) The **mind** – though rarely defined beyond being called the same as the ‘activity of the brain’ – in addition to including consciousness and subjective experience, is seen as *an emergent, self-organising, embodied and relational process that regulates the flow of energy and information.*
2. **Energy**, according to physicists, is the ‘capacity to do stuff’ that manifests itself in many forms. Energy can be measured as a potential, one that some physicists state can be seen as a probability distribution spanning from certainty to uncertainty.

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3. **Information** is a pattern of energy with meaning or symbolic value. Not all energy has information even if it has aspects, features, dimensions and qualities that can be measured and assembled as data. All information, however, as far as information scientists and psychologists seem to concur, is created from *patterns of energy*.
4. **Human development** is shaped by how energy (and the subset of energy which is information) streams both *within* the body (especially the nervous system including the head collection of cells, often called, simply, 'brain') and *between* people and the environment (this is the relational aspect of energy and information flow). In other words, *energy flows both within us, and between us*.
5. Though the mind is often described as having various activities such as thoughts, feelings and behaviour, the 'mind' beyond being equated with brain activity is actually rarely, if ever, defined. But as you can see from the above, in IPNB we offer a definition of mind. This definition has significant implications for predicting future research findings and for creating practical applications to strengthen and bring more health to the mind. It is from this starting place that we will explore human development below this list of principles.
6. Self-organisation of complex systems optimises 'complexity' by moving a system toward harmony. This is an emergent unfolding that has the five features of being *Flexible, Adaptive, Coherent, Energised* and *Stable*. Notice how this spells the word, *FACES*.
7. To create *optimal self-organisation*, a complex system links differentiated parts of itself. In IPNB we use the central idea and term of '**integration**' as the way differentiated aspects of a system are linked together. Integration requires that the separate, specialised parts retain their distinct features, but then also become linked or coupled with one another. This is how we say the '*whole is greater than the sum of its parts*'.
8. Integration is the basis of harmony. From an IPNB viewpoint, *integration is the fundamental basis of health*.
9. When a complex system is *not* integrated, it tends to move toward *chaos, rigidity* or *both*.
10. IPNB offers **hypotheses** to explore these proposals. Such educated guesses include the notion that *integration within relationships likely stimulates the growth of integration within the individuals – within their nervous systems, including their brains*. Another hypothesis is that *mental disorders are both an outcome of blocked integration and result in further impairments to integration*. Support for these hypotheses exists in the empirical research literature (see the second edition of *The developing mind* (Siegel, 1999/2012)).
11. Developmental trauma can be viewed through this IPNB lens as emerging from experiences that are not integrative. For example, severe neglect can be viewed as marked impediments to interpersonal *linkage*. Abuse can be seen as an impediment to interpersonal *differentiation*. Secure attachment, in contrast, can be viewed as integrative: a parent honours the differentiated needs of a child and links with them through compassionate communication.
12. Studies of developmental trauma by Teicher (2007) and by De Bellis et al. (2002) support this hypothesis and reveal that the integrative areas of the brain – such as the corpus callosum that connects right and left hemispheres to each other to promote bilateral integration; the hippocampus, which links widely separated implicit memory representations to each other to integrate explicit memory; and the prefrontal regions, which facilitate vertical integration – are impaired in their growth with abuse and neglect.
13. In non-experientially derived disorders as well, such as bipolar disorder, schizophrenia and autism, the work of Marcus Raichle and others has revealed impaired linkage or differentiation (Zhang & Raichle, 2010).
14. Interventions that may be useful for either developmental trauma or non-experientially derived mental disorders may benefit from treatments that, from an IPNB view, are seen as integrative. One example of such an intervention is mindful awareness training.
15. From an IPNB viewpoint, *mindfulness* is a form of internal attunement that, with repeated intentional training, can produce integrative changes in the brain. One example of this is the structural enhancements in the 'connectome', or how the separate areas of the brain are linked to each other.
16. Mindfulness training can be seen to enable a sensing function to be differentiated from an observing function. Both are important, each can be linked in the focused concentration and open awareness aspects of mindfulness.
17. The mind from an IPNB viewpoint is not 'only' the activity of the brain. In a recent paper by Parker and colleagues on 'The science of presence', we were able to explore how the internal experience of mindful awareness and enhanced interpersonal relatedness go hand-in-hand through this view of the mind as being both embodied and relational (Parker, Nelson, Epel, & Siegel, 2015).
18. As we look to a range of fields, from education and mental health to parenting, global health and public policy, we have found a growing interest in IPNB as a framework that supports both rigorous scientific insights and practical science-informed applications.

With each of these basic principles in mind, let's explore human development from both an inside-out and outside-in IPNB perspective.

## What is Developmental Trauma?

'Trauma' is a term we can define as meaning an experience that overwhelms our ability to cope. 'Developmental' means something that influences how we grow and change. The term, 'developmental trauma' often implies an experience early in life that altered the course of foundational development. Since we now know that even adults continue to develop, we could also extend that term to mean any overwhelming event that impacts our lifelong development. In this article, however, we will focus on the earliest years of development. Why? Because the basic foundational circuits of the brain that enable 'self-regulation' to emerge, that support the processes of attention, emotion, thought, relationships and behaviour, each form in these early years.

### Attachment

The study of parent-child relationships reveals that the *attachment* between a young individual and a caregiver shapes the way the child's mind develops. From an IPNB perspective, secure attachment is based on integrative communication that honours differences and promotes linkages through attuned, compassionate communication with repair of ruptures when they inevitably occur. Attunement is the focusing of attention on the internal world of the self, or other. The various forms of non-secure attachment can be seen as various compromises in the integration of that communication. In a recent book for, and about, adolescents, *Brainstorm* (Siegel, 2013), you will find not only a succinct but in-depth review of this perspective, but also steps on correcting these forms of impaired integration.

### Avoidant Attachment

In about 20 per cent of the non-clinical US population, diminished attunement can be seen as impairment to linkage. The result is impaired linkage of the child or adolescent, or adult, to their own inner mental and somatic life – or that of other individuals as well.

### Ambivalent Attachment

In about 15 per cent of the non-clinical US population, inconsistent attunement or intrusion of parental states on to that of the child result in impediments to differentiation. The child, adolescent or adult's internal state can be one of intense uncertainty.

### Disorganised Attachment

In the non-clinical US population, around 5 per cent of children studied may have a disorganised attachment in which significant neglect or terror induced by the parent figure is thought to result in '*fear without solution*' and there is no organised approach to this attachment relationship. This *biological paradox* is that the deeper brainstem reaction to

neglect or abuse can be to feel terror and a drive to escape that state of fear, while at the same time the higher limbic attachment response is to move toward the attachment figure for relief from the terror. If that attachment figure is the source of terror, then the brainstem and limbic drives to move away from and toward the same person cannot be resolved. In many ways both differentiation and linkage are impaired in disorganised attachment. The biological paradox is a situation that cannot be adapted to in any organised way. The internal experience of individuals with this form of developmental trauma is to have a form of internal and interpersonal fragmentation called dissociation.

## Prevention and Intervention

Ideally we would work as a society to support young children and their families in preventing the biological paradox of disorganised attachment and development trauma. Studies of the brain from the laboratory of Martin Teicher at Harvard University, mentioned earlier, reveal that it is the integrative areas of the brain that are impaired in their growth in cases of severe neglect and abuse (Teicher, 2007). Often such situations happen early, are severe and are chronic. In these many ways, sadly the development of the child's brain is significantly impacted. We should remain hopeful, however, that given studies of adult neuroplasticity, future therapeutic interventions – though intensive – may be of significant help.

However, because the brain's integrative areas are impacted, self-regulation will be affected. As far as we can tell, all regulation depends on integrative fibres of the brain as they facilitate the co-ordination and balance of disparate areas working in collaboration with each other to produce effective regulation.

As mentioned earlier, the consilient principles emerging within IPNB suggest that integrative communication stimulates the activity and growth of integrative fibres in the brain.

Attachment research utilising the Adult Attachment Interview (AAI) (see Hesse, 2008) suggests that one of the most robust predictors of a child's attachment is how a caregiver has come to make sense of his or her own early life history. For those with children with a disorganised attachment to them, the most common finding is that of unresolved trauma or grief. The many important implications of this AAI finding from Mary Main and her colleagues on disorganised attachment and parental state of mind (Main & Hesse, 1990) is that if trauma or loss can be resolved in an attachment figure, then disorganised attachment can be prevented in future generations.

Unresolved trauma or loss themselves can be seen as profound states of impaired integration. Making sense of one's life – resolving these overwhelming experiences – is a process that can be seen, from the lens of IPNB, as an integrative process. We learn to live fully in the present while being able to access, in an open and inviting way, any

experiences from our past, and link these to becoming the active author of our own life story.

And so we see that prevention of disorganised attachment may in fact overlap with the strategies for intervention for those who have experienced developmental trauma. Working with parents to enhance integration for prevention would be an important component in this arena. Working with children and adolescents who have experienced abuse or neglect would be an essential component of such a program, to improve the life of those individuals now, and to help prevent the cross-generational passage of disorganised attachment and developmental trauma for their offspring.

My deepest hope for this interpersonal neurobiology approach to development is that we can use the hard-earned findings of science to create effective interventions and prevention programs that will improve the lives of people now, and for generations to come.

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