

process called love. Saying it is of the mind, that is mental, means from this perspective called 'interpersonal neurobiology' which attempts to combine all disciplines of science into one perspective, that we must always seek both the embodied and the embedded nature of mind. Mind emerges in contexts – 'internal' regarding our physiology, and 'external' in our being socially embedded. Embodied and embedded the mind is.

Love as a mental process, I'll propose to you, emerges from a fundamental process called 'integration'. Integration is the linkage of differentiated parts of a system. Integration leads to harmony; impaired integration leads to chaos and/or rigidity. Love is the harmony of integration. When we honour differences and promote compassionate linkages, love emerges. Love can thus arise in various relationships that involve attachment, romance, sexuality, learning, professional pursuits, athletics and spiritual communities. A relationship is defined in this model of interpersonal neurobiology as a pattern of shared energy and information flow. When these relationships are integrated, love emerges. The embodied brain responds to integrated relationships with the activation of integrative circuits – ones that link widely separated regions to each other. For example, attachment relationships can be seen to promote the growth of integrative circuits – in the prefrontal region, the hippocampus and the corpus callosum – that co-ordinate and balance the nervous system (Siegel, 2012a,b). Therapeutic interventions that promote seeing the mind of another person – mindsight – with empathy and compassion offer integrative experiences that promote healing. Love is healing because love promotes integration. **P**

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We have chemistry! – the role of four primary temperament dimensions in mate choice and partner compatibility

Dr Helen Fisher approaches choice of mate from the perspective of biology, asserting that four neural systems are regularly associated with a constellation of personality traits

Passionate love, obsessive love, being in love, whatever you wish to call it. Romantic love: a cross-cultural phenomenon. Love songs, poems, novels, plays, movies, operas, ballets, myths, legends: the world is littered with the artifacts of this human passion. It begins as the lover starts to regard another as special, unique. Engulfed in energy and ecstasy, the lover plunges into

despair at the slightest adversity. Physical separation or social barriers heighten their romantic passion, what I call 'frustration attraction'. Many are willing to change their habits or beliefs, even die for this special other. The besotted thinks obsessively about him or her, known as 'intrusive thinking'; and they crave emotional union with the beloved. Indeed, this passion arises from primitive brain pathways for wanting (Fisher et al, 2005, 2010). It is a drive – a drive to pursue life's greatest prize: a mating partner (Fisher, 2004).

And at the core of human romantic love is a profound preference for a particular individual; no one else will do.

Psychological and social forces driving mate choice

Many social, economic, psychological and biological forces contribute to mate preference. We tend to gravitate to someone with the same socio-economic and ethnic background, with a similar level of education, intelligence and physical attractiveness; a partner who shares our religious and social values; and someone who can provide the lifestyle we seek. Timing and proximity contribute. And some psychologists believe we gravitate to someone similar to the parent with whom we have unresolved issues; who can provide the type of attachment we had with



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mother; or a mate who reflects the values and interests of our childhood friends (See Pfaff and Fisher, 2012). But academics don't agree on the role of personality in mate choice. Some report we are attracted to those with similar personality traits; others conclude that opposites attract; still others maintain neither play a role. So I approached mate choice from a different perspective: biology.

Four primary temperament dimensions

Personality is composed of two basic types of traits: those an individual acquires through experience, traits of character; and those with biological underpinnings, traits of temperament. Traits of temperament are heritable, relatively stable across the life course and linked to specific genes, hormones and/or neurotransmitter systems. Indeed, some 50 per cent of who we are stems from our biology. So I culled from the academic literature those personality traits currently linked with *any* physiological foundations. Then I designed a questionnaire to measure one's expression of these traits and put this questionnaire on an internet dating site. Last, in a sample of 28,000 men and women on this dating site, I watched who chose whom to date.

Only four neural systems are regularly associated with a constellation of personality traits (see Fisher, 2009, 2012; Fisher et al 2010). Variations in the dopamine system have been linked with novelty, experience and adventure seeking, susceptibility to boredom, impulsivity, energy and enthusiasm. People expressive of certain genes in the dopamine system tend to lack introspection; they look out not in. These men and women are also often intellectually curious, mentally flexible and creative. So I called this style of thinking and behaving 'curious/energetic' and dubbed them *Explorers*.

The suite of traits associated with specific activities and genes in the serotonin system include sociability, caution (harm avoidance), less anxiety and more close friends. Elevated activity in the serotonin systems is also linked with observing social norms, following the rules, respecting

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authority, orderliness, adherence to plans, methods and habits, self-control, precision, interest in details, conscientiousness, figural and numeric creativity, and religiosity. So I designated this trait constellation the 'cautious/social norm compliant' temperament dimension and dubbed those particularly expressive of this suite of traits *Builders*.

Prenatal endogenous testosterone priming is linked with enhanced visual-spatial perception and a keen understanding of 'rule-based systems', from mechanics to computers, maths, engineering or music. Those expressive of testosterone regularly exhibit acute attention to details and have deep but narrow interests. They also tend to be less socially aware, with poorer emotion recognition, less eye contact, less verbal fluency, reduced empathy and extreme sensitivity to rank. Yet they are often self-confident, forthright, assertive and emotionally contained, although they also experience more emotional flooding, particularly rage. I designated this trait constellation the 'analytical/tough-minded' temperament dimension and dubbed those particularly expressive of this trait constellation *Directors*.

Prenatal endogenous oestrogen priming is associated with contextual, holistic and long-term thinking, as well as linguistic skills, agreeableness, co-operation, theory of mind (intuition), empathy and nurturing. Traits associated with oestrogen activities also include generosity and trust, the drive to make social attachments, heightened memory for emotional experiences, keen imagination and mental flexibility. Oxytocin, closely related to oestrogen, is also associated with several prosocial traits, including trust, reading emotions in others and theory of mind. So I designated this trait constellation the 'prosocial/empathetic' temperament dimension and dubbed those predominantly expressive of this suite of trait *Negotiators*.

The questionnaire

My final questionnaire consisted of 56 statements. Data were collected using the US internet dating site, chemistry.com, until reliability was obtained in a US sample of 39,913 anonymous men and women. I then used eigen analysis on an additional set of 100,000 men and women. All individuals expressed all four temperament dimensions, yet individuals varied in the

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degree to which they expressed each.

Then, in a random sample of 28,128 heterosexual anonymous adults on the same dating website, I watched who chose whom to date. And because men and women often make up their minds about whether an individual is an appropriate long-term partner within the first few minutes of meeting him or her (Sunnafank and Ramirez, 2004), I felt an investigation of initial attraction was an appropriate focus for understanding a core aspect of mate choice, its beginning.

Mate choice

Men and women who were primarily novelty-seeking, energetic, curious and creative were statistically significantly more drawn to those who shared these traits, while those who were primarily conventional, cautious and rule following were also drawn to individuals like themselves. But those who were more analytical, tough minded, direct and decisive were disproportionately attracted to their opposite, those who were imaginative, intuitive, compassionate and socially skilled; and vice versa. In short, Explorers preferentially sought Explorers, Builders sought other Builders, and Directors and Negotiators were drawn to one another.

Why does similarity attract in some cases while opposites attract in others? Perhaps these human appetites are primordial reproductive mechanisms that evolved to insure the survival of the young. Take a partnership between a Director and a Negotiator.

Director and Negotiator match

These are very different styles of thinking and behaving, yet the Director and Negotiator have important things in common. Foremost, their thinking meshes. Both dislike wasting time on irrelevant or superficial conversations, and both like to discuss abstract concepts and generate theories. Yet the Negotiator sees the big picture, while the Director is likely to focus on smaller pieces of the puzzle; so both can impress. They are also likely to make decisions well together. The Negotiator will

see all the angles, while the Director will be decisive. Moreover, the Director needs the Negotiator's empathy, verbal acuity and people skills, while the Negotiator can marvel at the Director's candor, their goal-oriented focus and their gift of knowing their own mind.

Problems can emerge, however. Directors strive for efficiency and logic, a trait that can disappoint the expressive, tenderhearted Negotiator. Directors don't like redundancy either; they are not likely to say 'I love you' regularly or respond to other loving rituals the Negotiator needs to feel connected. Moreover, Directors admire self-control, so if the Negotiator becomes a drama queen (or king), the Director may retreat into hostile silence. The Director can also become impatient with the Negotiator's intuitive side, regarding it as airy nonsense. Meanwhile, the Negotiator may find the Director's insistence on tough-minded logic irritating, particularly if it tramples on someone's feelings.

But when the Director and Negotiator pool their complementary traits, they are likely to be an effective team for raising young.

Builder and Builder match

If Directors and Negotiators are pooling different resources to rear their young, Builders appear to capitalise on many shared strengths. Builders tend to be calm, precise, managerial and social; both like building community ties. And because Builders are modest, civic-minded and often popular, two Builders can create a wide, stable, social network. Nor are these men and women impulsive with their money, actions or feelings; security is important to both. Moreover, Builders are traditional. Duty, loyalty, patience, persistence and service are their strong suits, so both are likely to be devoted to domestic stability, overlooking their differences to make the marriage last.

But Builders can be moralistic: both are likely to believe there is a 'right' thing to do and a 'right' way of doing it. And both can be critical. So Builders are likely to bicker over trivial matters, such as how to do the dishes. And Builders refuse to compromise their standards: both can be stubborn. Moreover, Builders are the least sexual of the four broad styles of thinking and behaving. So sex – and the emotional closeness it often brings – can take a back seat to their individual schedules.

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Nevertheless, with two Builders, humanity has evolved another stable strategy for parenting.

Explorer and Explorer match

Explorers are curious. They have many interests: they love to learn, and they regularly seek novelty and adventure. Moreover, Explorers are likely to be impulsive, high energy, flexible, irreverent and very interested in sex. So two Explorers can have great fun together. They won't argue over life's little chores: when to take out the garbage is likely to be immaterial to both. They aren't likely to quarrel about money either, as most believe cash should be used to fulfil their dreams. Explorers don't follow schedules or prescribed ways of doing things, unless necessary, so neither will be fussy about rules either. Explorers are optimists. And their positivity, flexibility and mutual irreverence enable these couples to keep their spirits up when life is strained.

But two Explorers can find themselves in disastrous situations – financial or physical – because both are daring and impulsive. And what they gain in intellectual and/or physical adventure, they can lose in emotional intimacy because Explorers are wildly independent – even from a mate. Explorers aren't generally introspective either. So two Explorers can leave serious family issues unresolved. Explorers also tend to be charismatic and flirtatious, so they can stumble into extra-marital romantic situations. They are prone to addiction, too. And Explorers can become restless and hanker to move on as the novelty wears off. Yet this restlessness may be their biological strength. I suspect this type is more prone to making a series of partnerships, hence producing more varied young – another viable reproductive strategy.

Other matches

But what happens when an Explorer falls in love with a Builder? One is reckless, the other cautious; one likes novelty, the other basks in the familiar. Or when two Directors tie the knot? Both are sceptical,

competitive and have poorer people skills. Can two Negotiators ever make a decision? Both vacillate. And how will someone predominantly expressive of both Explorer and Builder traits cope with someone who is largely a Director and Negotiator? Every match will have different joys and sorrows (see Fisher, 2009). Moreover, each of us is a unique combination of these four broad biological styles of thinking and behaving. In fact, in my most recent study of 100,000 individuals, no two people answered these 56 questions the same way.

Nevertheless, each of these 100,000 men and women expressed these four broad personality constellations in some way: biological patterns to human personality exist. So when a couple walks into the therapist's office, they come not only with luggage from their childhood but with biologically based variations in whom and how they love. I believe these predispositions are worth knowing as the couple therapist embarks upon the journey into their clients' hearts. **P**

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