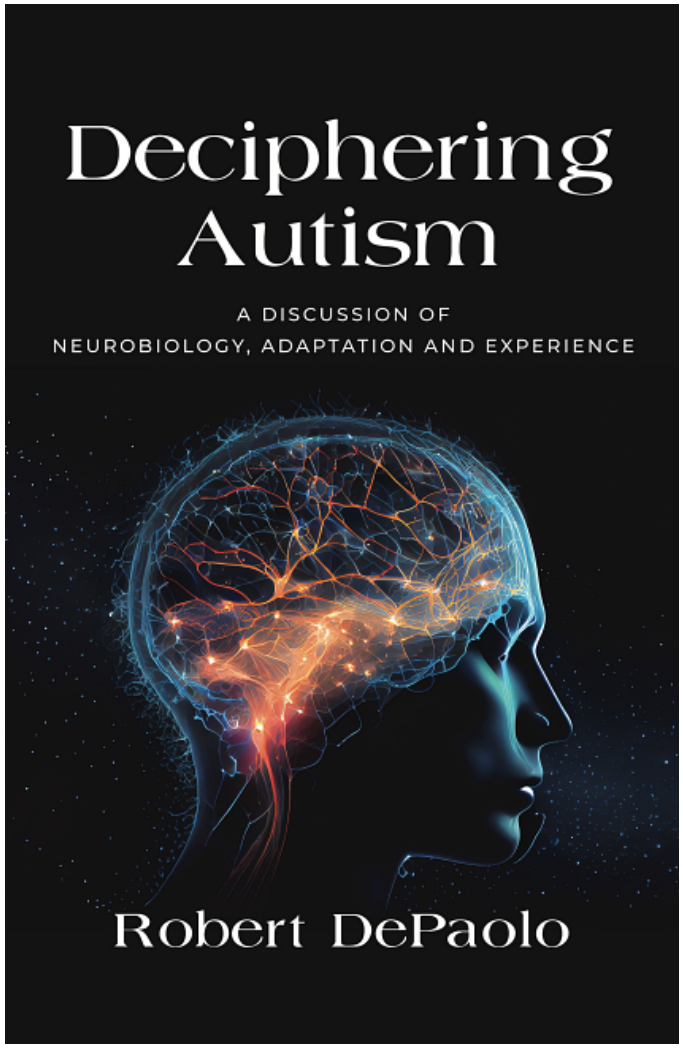

Deciphering Autism provides a comprehensive view of the disorder, including brain dynamics, genetic factors, and the ways in which autistic people adapt to their social environment.

Deciphering Autism:
A Discussion of Neurobiology, Adaptation and Experience
By Robert DePaolo

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Deciphering Autism

A DISCUSSION OF
NEUROBIOLOGY, ADAPTATION AND EXPERIENCE

Robert DePaolo

Reviews

As a professional linguist I appreciate Mr. DePaolo's description of language use and processing for autistic individuals. He handles the subject matter in a compassionate and often humorous tone with illustrative examples about how the brain functions and how over-stimulation can result. I recommend this book for both educators and caregivers alike, as he has both personal and professional experience within the autistic community.

Amy Bunell, Author and Professional Linguist

The knowledge and firsthand experience Mr. DePaolo has with autism is very well reflected in this book. As a mother with an autistic child, it was a great read. There is so much information provided and explained in detail. I have read several books on autism, but none have been as well explained and informative as this one.

Kika Perez, Parent of an autistic child

The opportunity to read a book on autism from several vantagepoints was a distinct pleasure. Robert DePaolo really pulls apart autism and offers so much material to research and contemplate. This book opened my eyes to a lot of information about autism that is not common knowledge. Anyone with an autistic child would benefit from reading this book. I am going to work on some of the techniques that were used with "Marie."

Michelle Fernandez, Parent of an autistic child

Deciphering Autism by Robert DePaolo is an authoritative and exhaustive exploration of Autism Spectrum Disorder (ASD). This book ventures into the multifaceted nuances of ASD, investigating its origins, manifestations, and potential treatment options. DePaolo masterfully navigates through the historical and societal backdrop of autism, while simultaneously providing an updated scientific perspective on the interplay of genetic and environmental factors in ASD development. DePaolo's quest to demystify autism leads to a lucid explanation of the neurological and cognitive mechanisms underpinning the disorder. His analysis of the hurdles encountered by individuals with ASD—especially in social interaction and communication—is particularly enlightening. His evaluation of diverse interventions and treatments underscores the critical need for personalized approaches.

Deciphering Autism is a compassionate and illuminating guide, offering invaluable insights for individuals with ASD, their families, and caregivers. The empathetic discourse within this book marks a notable departure from traditional resources that often focus primarily on 'managing' individuals with ASD. DePaolo's narrative, in contrast, is distinctively shaped by the lived experiences of those with ASD.

The author's emphasis on the vital necessity for tailored treatment strategies is particularly praiseworthy. He firmly advocates that ASD, far from being a monolithic condition, necessitates the consideration of each individual's unique requirements, thereby rejecting a generalized, one-size-fits-all approach.

DePaolo's comprehensive examination of ASD occasionally leads to scientific explanations that may come across as technical to the non-specialist reader. While this detailed approach might not be a stumbling block for those well-versed in the subject, readers seeking a basic understanding of ASD might find it somewhat daunting.

Deciphering Autism is an exceptional and powerful resource on ASD. As such, I recommend this book to anyone seeking an in-depth understanding of Autism Spectrum Disorder.

Literary Titan Book Reviews

A fascinating and scholarly approach to the body of knowledge about autism. The discussion is far reaching, encompassing child development, neurology, biology. physics and even the order of the universe

Alice in Scotland, Online Book Club Review

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Robert DePaolo is a retired practitioner in the fields of clinical psychology, neuropsychology, and educational psychology. He is former director of the Neurobehavioral Unit at Spaulding Youth Center, consultant with the Easter Seals Autistic Program and former adjunct professor of psychology in the New Hampshire University System. He is the father of two autistic adults.

Other Books by Robert DePaolo

Evolution, Information and Personality: Toward A Unified Theory of the Psyche

Hominids: A Perspective on Human Biosocial Evolution from the Treetops to the Renaissance

Resurrection

Bundy: A Clinical Discussion of the Perfect Storm

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Deciphering Autism:
A Discussion- of Neurobiology, Adaptation and Experience

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CHAPTER 4:
THE BAD MAESTRO

Despite prior references to computer-like computations the brain is not a computer. It is much more sophisticated and emotionally pliable. It developed over millions of years in a way that enhanced survival and allowed for adaptation in varying circumstances. A computer can "learn" in the strictest sense, but it can never know "why" it is learning. It can have goals but has no sense of purpose.

However, the brain and the computer have something in common. Both operate according to principles of information theory. Both feature information processing and storage mechanisms. Meanwhile, information, as classically and mathematically defined, typically takes the form of yes or no resolutions. In other words, it involves a binary system. While it is true that the latest quantum computers calculate by meshing information bits in holistic fashion the ultimate information attained even from that type of system must boil down to one of two propositions involving either resolution or non-resolution. Information in the truest sense is a yes or no complex.

In the binary system of a computer complex themes arise from resolutions to yes/no questions. Similarly, for all its complexity, functions, sub-functions, and abstract calculations, the brain also operates by a 'yes and no' format, in this case it involves bimodal excitatory and inhibitory neural activity. In the most fundamental sense the human brain, while responsible for building the Taj Mahal and developing the calculus, is really a complex machine that simply operates according to a "stop and go" format. Because of that simple paradigm it becomes possible for both the computer and the brain to engage in complex problem solving. The reason why is that having such a simple foundation allows both to enhance, embellish and cancel out inputs. It is a bit like the difference between playing the blues vs. playing jazz. The former has a simple foundation consisting of basic a-b-a lyric sequences and chord progressions. That opens things up for interesting solos and other embellishments within the structure of the song. Jazz is entirely different and far more complex. Improvisational – yes, simplistic – no.

One of the first indicators of "yes and no" brain is in the first year, when a child first begins walking. This is also a time when one of the first signs of autism emerges (particularly

when it involves walking up a flight of stairs). The normal child automatically shifts from left leg to right leg in a rough but intact rhythmic sequence. The timing of excitation and inhibition is fluid enough to support limb alternation. In many instances, the autistic child cannot do that without guidance. Rather, he or she might come down the stairs in a centralized cadence, where one step is followed by a pause but not by an automatic response by the opposite leg. As he or she gets older (depending on severity) that centralized tendency might continue. To some extent the child might develop stop/go, excitatory/inhibitory sequencing skills - even hand dominance - though that can be rare, but initially, movement does not seem to be computed properly. Flexion and extension are somehow delayed. The alternation between yes and no…or excitation and inhibition is confused. The question is why.

Studies by Sano, et al (2018) and Backstrom et al 2021) showed that autistic children and adults have difficulty with motor planning and sequencing, and that their movements (particularly when goal oriented) tend to be more random and less fluid than those of typical subjects. There are various reasons for that, but perhaps one stands out. It lies in the fact that on a fundamental level autism is a form of dyspraxia - a

lack of coordination not only in motor faculties but in the underlying neural timing mechanisms that must be in sync for memory. motor skills, language expression and attention span to operate properly.

Timing is a critical aspect of brain function. Various structural complexes are concerned with vision, speech, memory, cognition, and other functions. While proper neural connectivity is necessary for neural transmission, there must be rhythmic regulation for the brain to function normally. That is especially true for the human brain, which contains over sixty billion neurons and an even greater number of connections among them.

Several problems crop up when the brain's internal rhythm is off. Some of the problems this can create have been discussed in research projects on brain timing. For example, a study by Bai et al (2022) showed that language expression relies on neural cadence. In this study sentence formation was shown to set off neural firing patterns that occurred in a specific sequence, making conversational speech essentially singing without tonality.

While grammatical expression is typically viewed as a discrete breakdown of words (for example subject-

predicate-object sequences) it appears beneath that formal structure is a more fluid process that is implicitly lyrical.

The importance of timing in speech is clear from anecdotal accounts of stutterers, who can control their speech by speaking rhythmically or most notably, when singing. Also, every kindergarten teacher understands that singing lessons such as the alphabet comprises a memory friendly approach.

Some researchers and clinicians have used rhythm (specifically a metronome device) for treatment purposes, not just for autism but for brain injured military personnel and stroke victims (McDonough 2014). In line with the notion that timing is everything in the brain and that most human behavior involves a time clock mechanism (Evarts 2021), studies have been conducted to see how the timing process works.

Dr. Itzhak Fried, a neurosurgeon at the UCLA Medical Center discovered that Hertz low frequency brain waves accompanied neural firing during a variety of tasks, which offers a parallel to Pribram's notion of a regulatory holographic slow potential wave-like microstructure that continually sweeps across the brain and governs memory activities. The process was coined ‘phase precession’ and the

idea is that a rhythmic mechanism codifies neural firing in a pattern of succession during tasks. (2021). In still another research project, Traften Identified a brain circuit that encodes timing of events, particularly during memory consolidation (2021). It was in a sub-temporal lobe structure known as the hippocampus. It has long been recognized that this structure has an off-on fluctuation as inputs proceed from short term to long term memory. It is activated as a kind of holding function until memory is consolidated, at which point it deactivates.

In considering the importance of timing it becomes clear that so many functions can be affected with even slight timing aberrations. To begin with overall neurological development is a step-by- step process in which each stage triggers development for the next. Interruptions at any point in the process could have widespread impact. Secondly, even with intact development a timing glitch during task work can create halting, inefficient behavior. And finally, a timing glitch can lead to response fragmentation, frustration, and a tendency toward down shifting (analogous to Goldstein's catastrophic reaction) during which limbic - driven emotional reactivity takes over from cognition and goal directed behavior.

It is not surprising that the brain requires a timing mechanism, because the brain is part of the body, which is part of the natural world. All of nature involves rhythmic sequences. The heart, muscles and other physiological systems operated by rhythmic guidance, as do the climate, the seasons, and the rotations of planets around the sun. While the reason for this can extend to metaphysical and even religious arguments, there are concrete reasons as well. Rhythm is a guidance system. It creates order and enables all things in nature to operate in a way that creates redundancy, which ultimately makes the universe lawful.

When it comes to the brain the same process is involved. Wave functions in the human brain serve the same purpose as gravitational pull does on a cosmic scale. They provide synthesis, create systemic coherence out of chaos. Arguably, rhythm is the most efficient way to convey information.

Since the brain is an information storage and conveyance entity and since the human brain is so vast, it requires substantial timing and guidance functions to operate properly. One reason studies of so-called lower animals seldom mention nervous breakdowns or psychotic behavioral deviations is that their brains are not as big as ours and do not have the unfortunate potential to fly out of orbit

(like a planet ungrounded by gravity). Information theory holds that for true information to be conveyed requires a degree of redundancy and an ongoing capacity to reduce uncertainty. Without rhythm those ends cannot be met and a large brain can sacrifice stability – one reason humans develop psychoses and neuropathologies.

In the studies referenced above, timing was mentioned as a crucial aspect of brain function. Deficiencies in that area were deemed responsible for the awkward, overly centralized, and occasionally random movement of autistic individuals. However, it must be pointed out that "timing' in the way it is used in these studies is not the same as cadence or rhythm. Timing simply refers to one event preceding or following another. The fact that a person arrives on time for work at 9 a.m. means his arrival coincides with hands on a clock. If his timing was off, he might get to work at 9:15.

That is not the same as a governing, overriding, function that encompasses all the brain and provides a constant, regulatory flow. Neither is timing a grounding factor. It simply refers to a sequence of events that occur at a specific point in time. It also involves a certain logic. For example, one must eat food prior to digesting. The cerebellum must display a level of maturation before pruning in the frontal cortex can

occur. However, there is no governing aspect to timing. For regulation, there must be a pervasive vigilance and monitoring capacity, a faculty that can compute what is going on amidst all brain activity. For that to happen the process must operate like a wave rather than a clock.

There are two questions regarding that process. First, what form would this wave function take? Pribram's slow potential microstructure fits the bill in that respect. Second, how would this mechanism work and what implications would it have for the cause of autism?

Any discussion of wave mechanics as pertains to the human brain will tend to be complicated. However, there are basic ways to describe this. One is by describing two electrochemical patterns in the brain. The first is the sodium pump (active transport) mechanism that occurs when a stimulus impinges on the brain and produces energy through ATP (an energizing molecule formally called adenosine triphosphate) and changes the chemical balance in the cell between sodium and potassium. A second is through osmosis, as materials move through semi-permeable cells which need an energy burst for that invasion/expulsion (some in – some out) chemical transfer to occur. A third, consists of activity that travels slowly and continually across

synapses. It is not activated by stimuli or energy influx though it can change its structure in response to those occurrences.

If the brain operated solely by active transport (bearing in mind that the sodium/potassium transfer shuts down after the process is completed), the brain would stop functioning once the stimulus event ended. Something more ongoing is required to produce consciousness, response preparation, "feedforward" and overall monitoring of brain sites. Without that we would all be caught up in alternating states of lethargy and panic and we would be very ineffective in our actions.

The relationship between that process and the holographic brain model is clear. A holograph is a fragmented version of information - such as a visual image, whose parts are pulled together by flashing a light (often a laser beam) and synthesizes the parts into a whole. Once that stimulation is terminated the parts are scattered again. This has great value as an information system because no one site is needed for complete storage or response functions. Regarding brain function, partial memories could be stored everywhere in partial, re-integrated form so cellular damage in one area would not completely erase memories. Memory fragments are re-assembled and retrieved in a holographic system. It is also advantageous because, rather than being

gathered by a laser beam on a visual image the gathering stimulus in the brain could consist of wave functions arising from the slow potential microstructure. By sweeping across the synapses these computational entities would have complete access to everything going on in the brain, therefore could assemble disparate partial memories into wholes. With that, a person could be more ready to respond, have a more resilient memory, and have greater control over his or her environment.

The human brain obviously has individual parts with specific patterns of activity and cellular configurations, but that specificity appears to be secondary to its holistic features. Since the brain is part of the natural world parallels between it and universal phenomena are interesting.

In describing the operations of the universe English physicist Roger Penrose suggested there are two features of the cosmos: one consisting of separate parts, such as electrons, photons, planets. stars etc. The other is woven together and completely interconnected as a holistic entity. It appears the human brain has a similar structure. It has specific lobes and circuitry, but with redundancy filtered throughout its networks such that oversight wave governance

facilitates memory retrieval, anticipation and possibly coordinates connections among various networks.

That has bearing on autism, which entails a rhythm regulation problem. The brain of many autistic individuals lacks sufficient inhibitory/excitatory fluidity and capacities for anticipatory thought and motor coordination. That affects language, motor sequencing, sensory integration, and memory consolidation.

Certainly, autistic people have degrees of those skills but there are clear deficiencies as well.

To understand the essential nature of autism it is important to understand how such a regulatory and monitoring mechanism works. As complicated as it may seem (given the billions of individual neurons and connections in the brain) it might seem impossible to figure out how. Yet, as discussed earlier, the brain has two possible responses to each experience: yes or no – as manifest through the reactions of excitatory and inhibitory neurons.

One way to describe orchestration between the two is with the example of a musical score. This might be construed as a remote comparison. On the other hand, all humans are attracted to music. Nothing is quite as exhilarating. No other

stimulus is as powerful at conjuring up memories, at evoking joy or sadness. It is not a learned phenomenon, though people can come to appreciate some types of music more than others. It has a raw appeal that cuts across all cultures and languages.

Music has notes that occur in succession. The notes are timed - for example some might be eighth notes, or perhaps sixteenth notes that convey a faster tempo. Some, such as quarter notes, will be slower. A song has other parts. It might have lyrics that occur in a sequence. That involves timing in the most basic sense but that is not the orchestration referred to here. For the lyrics. notes, chord progressions and bridges in a song to take shape there must be an overriding time signature that governs all aspects of the song throughout its expression. The time signature could be the usual 4/4, 3/8 or 3/4 as in a waltz, or something less typical like a Dave Brubeck 5/8 composition. But it must be present, and it must guide the entire song.

The brain has wave functions. They are not comprised of neurons or dendrites. They are an abstract representation of an overall "something." Just why they exist has always been something of a mystery, other than providing some sort of after-effect of the brain's activation levels. There are different

kinds of brain waves. Alpha waves are slower than beta waves....and so on. Some occur during sleep, some during high arousal states. The question is whether they do more than that. Do they compute and regulate?

In offering a theory on how wave computation might work in the brain and how it might affect autistic functioning it seems helpful (if somewhat remote) to use the example of gravitational attraction.

Gravity, as conceived mathematically by Newton and described physically by Einstein, is two things: a physical force and an information system. Its physical nature is captured in Newton's equation, which stated that gravitational attraction is a dual function of mass and distance differentials. More massive planets draw in less massive ones and the closer the two the greater the attraction. This calculation is not exact, though it is generally accurate. Its main drawback is that it is not systemic. Not only are there multiple celestial bodies out there - each exerting their own gravitational pull but as Einstein demonstrated, there is a geodesic process involved – meaning that space has a fabric-like quality. Objects placed on that fabric cause it to fold and warp. In effect, less massive objects "fall into" indentations created by

more massive objects. That is how Einstein converted Newton's equation into a physical reality.

With that in mind, picture a planet revolving around its sun. The sun is not the only gravitational influence on the planet. The moon and other bodies in the vicinity will also attract celestial bodies and as a result engage in a tug of war contest with the sun. As a result, the planet will not have a perfectly circular orbit. Sometimes it will be pulled away from the sun's attraction and its orbit will be elliptical. In fact, that is often a contributing factor to climatic fluctuations on earth including warming periods and Ice Ages. However, absent extreme events the planet will never divert completely from its rotation pattern around the sun. Thus, while the planet can deviate from its customary path it is nonetheless grounded in its orbit around the sun. In addition to being a product of physical laws, this is an information process. An information exchange occurs between a planet and its sun, as if a memory that encodes or recalls what its path should be. If it does deviate on occasion that memory will create a "bounce back" response so that normalcy is restored. Therefore, as long as the masses of the sun and the earth remain in roughly their current state there will be 365 days in a year and the earth will not exit the solar system.

Gravity is comprised of waves, which provide the information content for the overall stability that keeps the universe from flying apart. What does this have to do with autism?

In this writer's experience in clinical and educational settings, the movement patterns of autistic individuals tend to be neuro-behaviorally centric. A typical person can walk toward a building, turn his head, wave to another person on his left, then turn to his right to look for ongoing traffic without altering his walking pace or direction. Like a planet in orbit, he has a capacity for "grounded divestiture." He can maintain his constant "movement orbital path."

Similarly, the baseball pitcher can wind up, lift his leg, looks briefly to first base to see if the runner is poised to steal second. Then, with his leg in the air and his arms hung over his head, he will still be able to follow through with a pitch to the plate. He can divert eye focus and attention, and still control the direction of the ball. Even if low and outside, it will still go in the intended general location.

Many autistic individuals cannot do that. Even in the sequential alternation from left to right leg in walking there is a tendency to hulk down and centralize the limbs in movement. It is as if they know deviating from central control

could interrupt execution of the act. In essence, they seem to lack whatever compensatory mechanism allows the average person to divest and return to a predetermined action plan. This seems to extend beyond movement and directionality to language and cognition.

The question is why. Here is where the gravity analogy applies. While both the autistic and normal individuals are exhibiting brain activity during movement only one can monitor and regulate movement patterns to hold movement goals constant.

To be able to do that would seem to require a capacity for holistic memory - not short-term memory, but a moment-to-moment regulatory process that keeps movement goals and general intentions constant even as sub-movements and sub-intentions create temporary diversions. And just as gravity requires energy so does the capacity to hold movement constant despite deviations from the center. That suggests (in a way more than metaphorical) that autism is typified by energy depletion.

If such an energy fueled regulatory mechanism is real, it might have to take place outside the core hardware of the brain. It would have to be, in a sense, nonmaterial and to have complete access to all brain activity via a sweeping process.

Its overall governance would likely have to occur through some sort of computation by apportioning the yesses and no's of excitation and inhibition, then sending signals to the rest of the brain derived from binary computations. That would require a neural language or encoding mechanism.

If these computational conclusions were expressed in a conventional sense, it might sound something like this: A person intends to walk into a building. "Building approach excitation" dominates. his brain activity. He sees a friend, stops, waves to his left or right and temporarily deviates from that goal. However, while there is inhibition and temporary stoppage of the main intention but the excitation pattern corresponding to entering the building still outweighs the inhibition pattern. Therefore, the intention to enter the building is still dominant and maintained. The central goal of heading for the building equals X number of yeses (excitatory neurons) while the deviations from the main goal equal Y number of no's (inhibitory neurons). As long X exceeds Y the person will be able to adhere to his original intent of entering the building

In general, it would involve calculating priorities. Sub-behaviors (like waving to the left) would be assigned a lesser value than walking into the building. Other minor behaviors

- for example, stopping to fasten a belt or tie a shoelace would also be assigned a lesser value. On the other hand, if the building suddenly caught fire, the priorities would change. Fleeing from the building would take on a higher value than walking into the building. In that case, Y would be greater than X. In any case, the apportionment of actions would likely have some sort of binary computational feature.

That example matches the holographic model proposed by Pribram. It suggests problematic, overly centralized tendencies and difficulty diverting and returning to an original intention reflects how the autistic individual deal with his environment. It might also mean centricity is a compensatory reaction by a person who recognizes that he has a problem controlling the alternation between diversion and focus.

Except for so-called high functioning individuals, autistic speech is also highly centralized. Phrases are cluttered together without cadence in many cases. Tenses are mixed and to speak, the autistic individual must compensate for the dyspraxic nature of his brain by upping the volume. He will often push sounds through, which gives his tone a spiked, loud quality.

The same would apply to an autistic person's expression of emotion.

Intense emotion could certainly be the result of concrete cause and effect circumstances; for example, lashing out when asked to overextend his or her attention span or withdrawing from loud noises. Still, the ongoing memory process ostensibly provided by the wave calculation would be lacking. Deviations could not be reined in and that might lead to extended periods of emotional expression - for example a tantrum lasting for hours.

In the perceptual and cognitive domains, a deficiency in oversight memory would result in overly repetitive behaviors as well.

Another reason for the inability to control deviation-cohesion sequences could be that once a behavior deviates from an original intention, arousal generated from that deviation would be too intense for the actor to return to the original intention. The person would be too activated for the shift to occur.

Arousal is memory bound. The brain knows when to become activated and when to dampen activation, but this must be done "above the fray" so to speak. A wave

computation provides that capability. When that mechanism is less than functional the return to a normal state of action or feeling becomes difficult if not impossible.

In that context, it is important to discuss the developmental aspects of the wave function. Certainly, like all other brain structures and functions it must have a point of origin.

According to an article in Neurofeedback Alliance, entitled: *Understanding Brain Waves,* the consensus seems to be that brain waves are an after-effect of neuronal activity and don't necessarily have independent functions.

There are reasons to question that opinion and to believe wave activity has a proactive role. With that in mind, discussion of wave phenomena seems warranted.

There are four main types of brain wave activity. The alpha wave is active during periods of quiet thought in a resting state. It is said to result from interactions between a midbrain relay network called the thalamus and the cerebral cortex. That would seem to suggest a passive role. On the other hand, alpha waves have also been considered pivotal (and functional) in binding and reallocating neural interactions when they are out of sync and in providing the

appropriate level of activation to inhibit and block out irrelevant stimuli during problem solving.

Beyond that, alpha waves have been linked to activity in the Reticular Activation System - which makes sense, given the RAS role in general arousal.

Beta waves are faster paced and emerge during normal states of consciousness and cognitive exercises. The beta wave has its own proportion. It is dominant in the brain's left hemisphere where language and other sequential, grammatical functions are housed. Interestingly when beta waves are detected in the right hemisphere mania usually results.

Delta waves are the slowest and occur during stage 3 sleep. An excess of delta activity has been associated with attention deficit disorder, learning disabilities and autism.

Theta waves are active during daydreaming but have also been shown to act as facilitators of encoding, memory retrieval and attention span. Gamma waves, the fastest, are active in intense problem-solving exercises. Low levels of this wave activity have been linked to learning disabilities as well as impoverished emotional states while high levels of

Gamma activity seem to correlate with higher intelligence, compassion, and general happiness.

While use of electroencephalographic studies has been done for years it seems a bit curious that brain waves have been deemed both the result of neural activity and the regulator of neural activity. Those two conclusions seem contradictory. The feeling here is like almost every closed system the relationship between neural activity and brain waves is reciprocal – each affecting the other. Electrochemical stimuli can produce and alter brain waves, but once those waves are activated, they do not simply meander around the brain. Instead, they send signals back to the neural structures responsible for various skills and functions. That would suggest a feedback process is involved, which at face value coincides with the wave computational hypothesis.

Studies on brain waves and autism are revealing in that context. Fields (2020) discussed research findings indicating that brain wave differentials (asymmetry) between activity in the left and right hemispheres are associated with autism. Indeed, that assumption has gained enough support that a treatment method known as EEG guided neurofeedback has

become a new and trusted method in working with the autistic population.

One of the recent items of focus generated from this research is called 'coherence'. This refers to discrepancies among brain waves in various sites in the brain. This problem has been likened to the cacophony of an orchestra before a performance, when musicians are stringing, flouting, and harping in no specific time signature or musical score – just messing around to get ready to play. When brain activity like that appears during infancy it can be predict the onset of autism (Contie 2013)

It seems apparent that problematic wave activity is a critical factor in creating what amounts to a "bad maestro." This neuro-culprit disrupts coordination among neurons in the autistic individual's brain, forcing that person to create his own rhythmic structure through movement, rituals, vocalizing, and strict adherence to routine.

If wave-based regulation is involved in the normal operations of the brain, it is possible that in line with holograph/holistic concepts of brain function some facsimile of an integrative "laser beam" is needed to normalize experience.

One reason for optimism regarding the wave-computation theory lies in the fact that while so many brain sites and functions seem involved in autism a more central causation focusing on wave regulatory mechanisms would be convenient and potentially beneficial for both diagnosis and treatment. Such a focus might also provide a more comprehensive explanation of what autism entails.

Beyond that, there are reasons why focusing on specific sites might not be an optimal approach. For example, not all autistic subjects show aberrations in frontal, R.A.S. or hemispheric structures. Also, a percentage of normal subjects did show such abnormal structures and functions yet exhibited no pathology. In terms of research design that might not be significant. Science deals with probabilities, not absolutes. However, the fact is, many people have abnormal structures in their brain that are not manifest in language, cognitive or motor deficits. Notwithstanding the probabilistic nature of the scientific method, one must ask why.

One reason could be that wave computations have a higher role in brain regulation and can in many instances compensate for both structural and functional problems by overriding neurological glitches - analogous to the way in which a computer can detect and erase viruses.

In that sense the wave function might be more than a regulator. It might act as a check and balance on pathology. and a corrective/feedback mechanism as well.

Though that might sound a bit vague, corrective feedback exists in all biological systems. For instance, certain genes are "corrective" - or regulatory. That is necessary because with so many elements involved there is some probability that something in the lining up of genes could go wrong, either in utero or in later development. To normalize a population there must be an oversight process that ensures to a large degree that organisms develop in line with a species template.

Beyond that is the homeostatic mechanism within the body proper. If the body heats, the person sweats to cool it down. If the body gets too cold, heat is retained and muscles contract to restore the 98.6 standard of homeothermy (warm bloodedness). To assume the brain lacks such a restorative capacity might be a bit naive. A wave-computation model fits the bill in that respect.

The only question has to do with the nature of stability. Whereas the body's restorative functions revolve around physiological homeostasis, in the holistic model, it would entail an informational type of homeostasis. While at face

value that would appear to go beyond the usual meaning of homeostasis, such is not the case. Homeostasis (the systemic capacity to keep physiological functions within normal parameters) serves the purpose of survival and would have evolved in that context.

Having a stable base of information in the brain would enable the organism to respond effectively in its environment which would also serve the purpose of survival. The lioness must be coordinated enough to hunt effectively. The movements of the wildebeest must be fluid and fast enough to escape from predators. The human female must have sufficient cognitive ability (and arguably an empathic capability) to understand an infant's needs well before the child can communicate.

Take that away and you take away effective behavior which lessens the chances of survival for individuals and the species.

Another aspect of autism with relevance for wave regulation is the tendency toward behavioral and neurological spiking. Perhaps due to lack of ongoing rhythmic regulation autistic persons tend toward emitting very spontaneous behaviors...in common parlance they can go readily 'from zero to sixty.' In not having adequate

oversight through brain wave activity this might be the only way they can negotiate within their environment. As discussed earlier, their activity levels tend to fluctuate between being extremely low and extremely high. The flow of activity is very uneven. If this was simply a function of neural firing patterns there might be a tendency toward one or the other. Instead, it appears governance in the broad sense is lacking, not in terms of timing in the classic sense but in maintaining a cadence from one behavior to the next without missing a beat. That seems to entail more of a regulatory process than a strictly structural one – a wave rather than a circuit.

One more theoretical problem remains. There is a difference between the customary brain wave patterns and the slow potential micro-structure referenced in holograph theory. A slow potential mechanism is exactly as it sounds. It features much slower wave activity that appears to emanate from specific sites in the brain but ultimately sweeps across the entire brain and is not isomorphic with the neurons that prompt its activity. In that sense it supersedes the tangible brain. It is software, not hardware.

The wave is a critical aspect in any information system because a wave is at once part of an energy mechanism yet

also separate from it. For example, the waves in the ocean are not synonymous with water molecules. In fact, a wave is not material per se. It is a continuous combination of motion and energy. Thus, ocean waves cannot be described chemically yet they drive the motion of the water. They compute the distance and force of the water, without themselves being definable materially. To presume that brain waves have similar parameters seems reasonable, which makes them an interesting and possibly crucial determinant of what goes wrong in autistic development.

On the other hand, while not material, waves do have energy. They have specific amplitudes and frequencies as they move through crests and troughs and each of those components conveys a level of energy. That is important because it turns out energy is an important factor in the essence and causes of autism.

CHAPTER 16:
A DAY IN THE LIFE

In this chapter an account of autistic behavior is discussed in what is typically referred to as the "in vivo" or (real-life) method. The autistic individual in question is both representative and real, because while his specific identity is concealed, his actions, perceptions and beliefs are quite typical of the syndrome. Some of the details are picayune but including them is a means by which to capture the inner world of autism and offer explanations of why they do what they do. Neurobehavioral correlates are presented alongside the behaviors to demonstrate causation and possibly clarify the why's and wherefores of his behavior patterns. With that…the account begins.

7 a.m. Richard is stirring in his bed. He utters a few words to himself in very soft tones, as if to regulate and stimulate the waking part of his brain. This goes on for a few minutes, then is followed, not by a slow, groggy exit from his room but by a rather abrupt dash to the living room. He is not upset. That's not the reason for the quickness. There is no emotional reason for his bolting out of bed, just rapid footsteps accompanied by a pleasant demeanor. As is the case each morning, he

goes from zero-to-sixty without any significant emotional thrust behind the movement. He then uses the bathroom, sits on the seat for a while – reverting to "near zero" and when finished, he comes out, once again, accelerating back to "sixty." He sees some paper scraps on the floor, immediately goes to a closet, grabs a broom and dustpan, and cleans it up. Every piece of paper is swept – no stone unturned. Having attained closure, he then sits in the parlor – back to zero. He then waits for breakfast to be served.

The pace is uneven, and one would think the shift so immediately from slow to fast and back again would take a toll on him – but it does not. He is acclimated to the uneven pace. It is his modus operandi – simple as that. He has learned a lot over the years, not just work skills, and athletic skills but in cultivating a helping mindset, and he is dutiful.

Yet each task, each skill features basically the same pace.

After breakfast is consumed there is a rush to put the dishes in the sink. He does not insist on washing them right then and there because another routine is on the docket. It shows he can keep more than one memory in mind at a time and since he knows the dishes will be done later there is a sense of futuristic thinking. Duty is on hold, but not forgotten, and certainly not abandoned.

The next step is getting dressed, which is not a problem although he occasionally puts the left shoe on the right foot and vice versa. A simple cue – "wrong foot" leads to an immediate correction. The fact that he is used to that cue helps. The first time it was issued he needed guidance to complete the switch. In these first morning instances the excitatory dominance typical of autism and the tendency to express language and other skills through the prism of linear cognition become obvious.

Now it's time to prepare to go out. He is cued to brush his teeth but needs no cues really. The sequence has occurred so often that he can anticipate the responsibility. It gives the lie in many respects to the ostensible frontal lobe dysfunction that ought to preclude the capacity to look ahead and anticipate events and consequences. On the other hand, this capacity only developed in a specific environment in which cues were delivered by specific people (his parents) and there is no way to know whether he would demonstrate the same capacity with a person he did not know.

Then it's out the door and off to the gym where he shoots baskets with his father. He has some difficulty mustering the accuracy to shoot from the free throw line but closer in, he is very accurate. For half an hour the game goes on. His linear

cognitive style transfers to his "game." If Dad wants to dribble round and take a shot or two, Richard will try to steal the ball – he is obsessed with scoring…he is the shooter- the alpha, Dad is the set-up man and obligatory point guard. Then it's off to a fast-food place to get lunch. Richard is a bit hyper and after a trip to the bathroom he has his meal. He quickly and dutifully puts the food cart in the slot where it belongs and then proceeds to rip the paper wrap into small pieces before putting them into the trash bin. It seems putting them in without breaking them down would be a violation of his closure-based belief system. Why the closure?

As discussed earlier, his central nervous system is designed to see things in narrow terms, specifically, beginnings and ends. Thers is no middle ground, no subjunctive, cognitive slant on things. Everything either is or is not. Black or white, open, or shut, perfect, or imperfect. He is not visually color blind. yet the experiential shade of gray eludes him.

On the way home in the car, he puts on the radio. He does not like listening to people talk due to what he perceives to be a distinctly staccato tone - too choppy for him to assimilate. He adjusts the dial and comes across a shock jock railing against every athlete on the planet. He finds another channel.

Springsteen and the E Street Band are cranking out 'Born in the USA'. He is not overwhelmed by this and turns up the volume.

After giving it his all at the gym, he is a little revved up and a bit of repetitive behavior creeps in. He wants a piece of gum and issues a verbal request consisting of: "hurry up." His father reaches into the glove compartment. Then comes a request for more, then more and still more. Richard is caught in a bit of a neural trap. He does settle down when denied a fourth piece, gathers himself and turns up the radio volume and the car heads home.

At home, time to take a shower. He does so, gets cleaned up, wipes himself off and dutifully puts the towel down a laundry chute. He doesn't seem to think the towel be used more than once. Once again, life is about abrupt and adamant beginnings and ends - plot, character and climax are irrelevant.

He then goes downstairs to the laundry area and removes clothes from the dryer, brings them upstairs and helps put them in a drawer. His performance is not perfect. He is a bit tired now and when that occurs, his cognition, attention and motor control waver a bit. He begins placing socks in with

underwear, shirts in with pants. Reminders help, but he is tired.

Then comes a nap. He is aware that he has extended himself – his energy levels are commensurate with mitochondrial availability, which is likely problematic. The fact that he will rest voluntarily is a vast improvement over a time when as a younger boy he would often escalate in mood and activity after extending himself with no awareness of his internal state. Time has taught him and those with whom he interacts what his energy limit is, in terms of muscle exertion, focus and the patience necessary to carry out sequential tasks.

Tomorrow, his focus will be much better.

Next, up for dinner. He is fortunate enough to be able to reinvigorate and reorient himself. Knowing that due to his work ethic there will be more to do (he insists on doing dishes within five minutes of finishing the meal) he uses the neuro-behavioral adaptations of rhythmic vocalizing and hand movement to summon energy and get back to work. He is quite knowledgeable about this process, having used it before in varying circumstances.

If one watches and listens carefully there is clarity of expression involved. Hand movements signal a can-do mentality. Like all members of a species that eventually learned to use their opposable thumbs in utilitarian fashion – making tools, painting in the caves at Lascaux, carving up meat – he is preparing for duty. Meanwhile, the vocalizing is soft but meaningful. Phrases like: "Hurry up" and "Come on Dad" are barely audible – no doubt a function of the energy depletion factor. Having to sift through the morass of entangled neural circuits to sculpt out a phrase forces him to sacrifice tone for meaning. While the average person can control content, tone, articulation, tense, meaning, and word order, he lacks the intercommunicative software with which to juggle so many balls in the air at once. So, he adapts, he compromises because he is aware of how his mind and body operate.

The meal is finished, the dishes done. He sits and relaxes, watching sports on TV. He is interested in that type of programming because he plays sports. He skates, plays a little basketball, plays a rudimentary form of tennis – "just keep the ball inside the lines, we won't keep score" and he rides a bike. On the other hand, he does not relate to drama or comedy and certainly not to cable talk shows.

After a while, Dad sits down at the kitchen table and works on completing tax returns. Richard is bored, he seeks attention. Dad is more interesting than a tennis match between two women from Slovenia. He requests a snack, then wants to sweep the floor – he views work as combined time filler and entertainment venue. Dad is busy – no deal. Richard won't take no for an answer, but rather than becoming defiant he resorts to plan B, which involves finding another task they can both do, that they must do.

A fan has been running in the parlor and the temperature in the room is not hot enough to have on. Richard gets the fan, takes Dad by the hand, says: "Come on" and through his version of behavior modification he cues his father to put the fan in the den.

The quest for attention continues, but tax returns are important, so a bit of scolding occurs. Richard gets the message, then does something interesting. He does not stop bothering Dad. The linear neural configurations in his mind do not allow for a 'stop' in his behavior. Richard's life and outlook are based primarily on excitation. His neurology makes him the quintessential go-getter. Obedience for its own sake runs contrary to that orientation. Still, Richard understands the situation and his father's irritable tone, so he

goes to his room. He was not timed out by his father or directed to go there. He just went there on his own. While not knowing that his actions derived from neurological characteristics, his response was adaptive and once again reflective of a disguised but extant sense of self. He does not have enough capacity to cease (at least not consistently or without a great deal of repetitive teaching). Therefore, he can only move from one action to another – almost always on an excitatory track, in the hope it will please those with whom he has close relationships. It worked well this time and with that, the tax returns are completed.

Another issue crops up. Richard perceives debris of some sort on the living room rug and makes this known to his father. The vacuum cleaner is brought out and Dad notices that Richard was quite right – the rug could use a little attention. However, when he starts to vacuum Richard insists on doing the job himself. Is it to save Dad the work? Not likely. Instead, Richard sees this as his job. It is what HE does and only with completion of the task will closure be attained. Here the singularity of thought in autism becomes clear. There is a belief that certain people do certain things – but not other things.

It is a narrow world with stringent associations and obligations. Yet it is also a sign that the personality emerges in autism just as it does with anyone. Here Richard displays a kind of arrogance. He believes he can do the job better than anyone else. He believes not being allowed to do the job would be a miscarriage of principle. He is offended by any other version.

While these sentiments are not expressed in complex linguistic ways – his only response is to say: "My way" – the feeling conveyed is the same.

A view of self and others seems to have cropped up along the way to young adulthood. However, this kind of advanced perceptiveness seems to be a part time phenomenon. Most of this occurs when he is clear-headed and such insight seems to vanish when he is hyper-aroused and particularly when he has an allergic reaction.

As his mitochondrial system is somewhat dysfunctional, he is prone to immunological difficulties. He is a robust young man, well-built and six feet tall, but he is allergic to pollens, dust, and other elements – some yet to be identified. Whereas the average person responds to allergy attacks with a runny nose, dizziness and perhaps a mild headache, Richard becomes disoriented. His cognitive abilities decline, his

behavior becomes unalterably repetitive, and his facial expressions reflect confusion and agony. Medication helps, as does his cue-dependent learning style, because while being told/cued – "the medicine will help you" does not resolve his irritation immediately, getting hopeful termination cues helps. At that point his facial expressions reflect a more hopeful demeanor. In time, he will feel better, but nowhere is the mitochondrial impact any more evident.

Still another behavioral consideration involves seasonal changes. The change of seasons, particularly for those living in a varied climate, typically leads to changes in activity and mood. In normal circumstances the emergence of spring brings a sense of renewal, perhaps manifest in goal setting, new relationships, or simply an extra hop in one's step. With summer comes a continuation of an upbeat mood, albeit a more relaxed version, caused by combinations of increased sunlight, time at the beach, opportunities to do some landscaping and time to be active in general. Next comes the cozy fall, with just enough cool weather to feel invigorated and not enough to shiver after exiting home on the way to work. Then winter, with decreasing sunlight, slower metabolism and the burden of snow shoveling.

Each of the seasons prompts changes in hormone secretion. For most, that is not a problem. We can express spring jubilance or winter funkiness through language. We can commiserate with friends about the last storm or discuss the fabulous vacation we're planning in July. Most important, we have control over our arousal levels, both in terms of how high they get and their duration.

The autistic individual does not. He is a victim of seasonal change. The highs get too high. The lows too low. As a result, behavior can be expected to change during these transitions. Richard will tend to become hyper-aroused or more lethargic depending on the season. Add the allergy effect in spring and the potential for heightened agitation increases.

That is why Dad does not look for a specific cause of his irritability in such times and why medication, anticipation and forgiveness enable Richard to maintain his faith in the father-son relationship.

Back to the taxes. The forms were completed but wait! Dad seems to have misplaced one and can't find it anywhere. Searching under the table, in other rooms, and in the den yields no results. Panic sets in. Then Richard looks under the computer, finds the form and brings it to Dad. This is one of those instances in which the autistic mind is superior. Dad has

normal vision but the interference patterns in his brain enabling him to fill out ridiculously complicated tax forms also force him to see everything in context - figure and ground, always figure and ground. Richard on the other hand sees the world in narrow, magnified ways. Because his mind and his perceptions are more linear, whatever he looks at, hears or touches is more vivid, more blatant. Naturally, this applies to finding the tax form and he does. He hands it to frustrated dad– piece of cake!

Meanwhile, Dad is amused. He's seen this before, regarding lost car keys, misplaced hats, and pairs of sneakers. For a moment, he waxes philosophical. For all the energy it takes to raise an autistic son, all the concerns about the future, the frustration the boy must endure as the result of his needs, yet his inability to grasp the nuances of the world in which he lives, there is a very important silver lining. Since Richard perceives things so vividly it stands to reason that all his experiences are magnified. That means he might find small things thoroughly enjoyable. A good meal would become a great meal. A half hour shoot around at the Health Club would be tantamount to having a ticket to the NBA finals. A touch of the shoulder for helping with the laundry followed

by the statement…"You're a good worker" would be a revelation.

As for the social detachment barrier: in that moment and through mutual understanding between father and son, it will have been breached. It seems autism is not always what it appears to be.

Bedtime brings its own unique transitions. Richard cannot go to bed until the entire household is ready for bed. He wants Dad to go to sleep at the same time he does. He can be coaxed to deviate from this control tactic, but it takes time and persuasion.

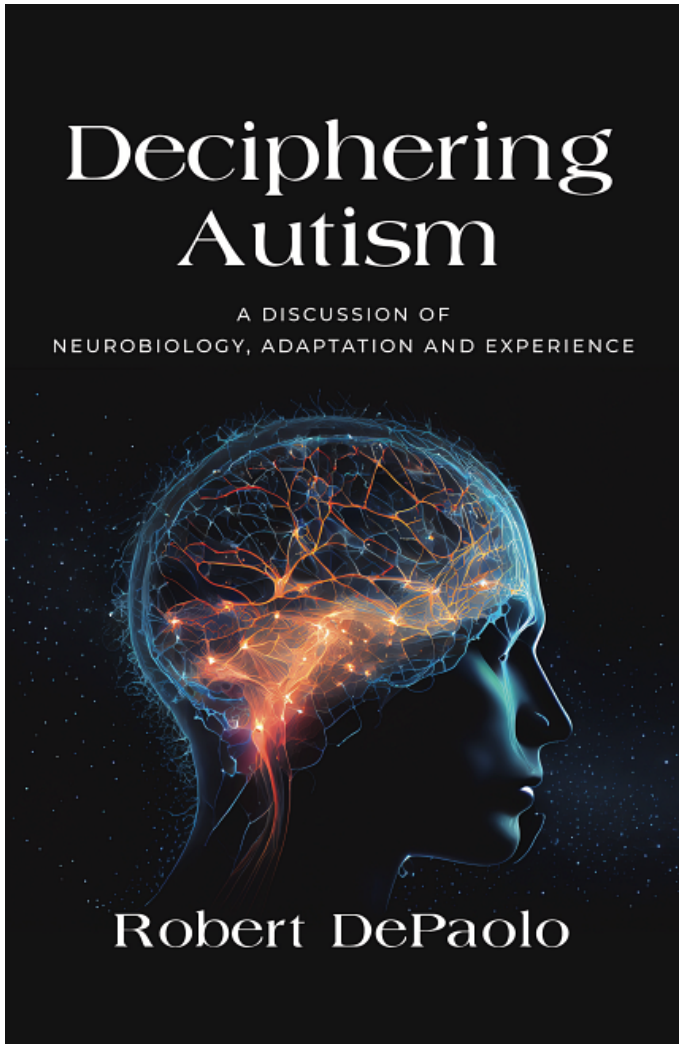
The question is why? Is he concerned that his father will not get enough rest? Does his hidden insight extend that far? Or is it something else; perhaps a feeling that a person he depends on should be "in sight" to be "in mind?" Is visual absence such a concretely anxious experience that control becomes necessary? The linear cognitive style inherent in autism suggests the latter might be an accurate way to capture Richard's intent.

This phenomenon is not often referenced in discussions of autism, in part because social detachment is presumed a priori to be a central component of the disorder. Here it

seems attachment is a very real thing, that perhaps autism has little to do with social detachment. Instead, is seems possible the autistic individual's oblique versions of eye contact, language reception, emotional responsiveness are byproducts of linearity driven by neuro-behavioral factors having less to do with social interest than is typically presumed.

Anyway, finally content that his father is ready to turn in, Richard concedes. In his bed a flurry of verbal behavior can be heard, making it a bit difficult for Dad to drift off in the next room. Then again it is interesting stuff – and much more expression that Richard uses during the day. What he says, using short phrases is a recap of the day. It is a memorializing of events, possibly providing context for his existence and a compensation for lack of the "card catalogue" language capacity that for most people frames experience on an ongoing basis. Is that because the automatic memory consolidation that for the average person occurs naturally, does not occur with him? If so, it appears Richard can offset the lack of automaticity ordinarily provided by networks in the cerebellum. It is an example of that miraculous capacity to prime the muscles, the senses, and the brain from outside in.

Does it happen at night because there are no peripheral stimuli to ward off? Hard to tell, but it would point to yet another creative adaptation to his deficits as well as revealing that he knows himself better than others believe.



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