

The explanatory model of the motoric movement action

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The motoric movement action *nerve spiral*



Caught In A Line

The explanatory model of all motoric movement actions

N.J. Mol

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Within writing as well as the nerve spiral and the marble run the (movement) action object (MA) i.c. respectively the tip of the pen, the ring and the marble within a perceptual image marks the division between the manifest and latent part of the action trajectory shape just like within all motoric movement actions. In which with other words the actually to be perceived place $P(0)$ of that action object marks the exact division between the passed positions $P(-x)$ and the near future positions $P(+x)$ of that exact same object which are essential to successfully fulfil the task demanded within the egocentric formulated will. In that way the explanatory model shows that line segment shapes of consecutive places P always occur, because the place $P(0)$ must always be connected to the places $P(-1)$ and $P(+1)$, which are constructed within perceptual images and that the factual image of the actual spot of the (movement) action object in a set relationship will always be a part of that line segment shape in which the object will finally has to fill the whole latent part of the action trajectory shape. So within this process two completely separated phenomena can be observed. In which one elucidates the perceptual side and the other the actual side which together in an overarching entity completely clarify how and where the perception-action coupling needs to occur within every imaginable motoric movement action. The aforementioned motoric actions are rather unique because they involve visible action trajectory shapes. At least within the nerve spiral and the marble run one can observe the manifest and latent part continuously and within writing the manifest part remains visible. Within the majority of motoric movement actions the action trajectory shape never becomes visible.

So the explanatory model indicates that this entity, hosting the perception-action coupling, executes the essence of the task within the egocentric formulated will and therefor clarifies that the primary focus must be pointed at this coupling process. In which it also shows that we are only capable of passively observing this process and only are capable of manipulating this process motorically with the help of another autonomous simultaneous occurring phenomenon within the motoric movement action. Hence it shows that the movement of an (movement) action object within an action trajectory shape, in which a manifest line fills a latent line segment shape, can only be regarded as an optimization process in which the explanatory model also shows that this optimization process can only be achieved due to the mutual relationship and the cooperation of the dorsal and ventral stream which are handed to us within current scientific research thereon. This mutual process clarifies within every imaginable motoric movement action that action trajectory shapes are executed “*shockingly*” or “*jerkingly*” and that is what the motoric movement action *nerve spiral* so plastically shows.

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1. The explanatory model in relationship to the motoric movement action *nerve spiral*

At a microlevel the clarification within this epistle has the sole goal to reveal all functional perception and motoric processes within the motoric movement action *nerve spiral*. However at a macrolevel the main goal remains to communicate the complete explanatory model of all motoric movement actions. The explanatory model namely encompasses the complete and final description of all functional perception and motoric processes within all imaginable motoric actions. The problem however is situated in the fact that the final explanation of the explanatory model is situated at quite a remote distance from the current mindset within the movement sciences. Multiple significant mind steps are demanded which in a compelling way need to be regarded in their complex relations with each other before the final insight which the explanatory model provides us can be obtained. All readers at all levels will have to take this barrier and although the specialists within this field of science already possess much knowledge about certain single components it is expected that especially they will have great trouble to obtain the quintessence of the explanatory model because they persevere c.q. are taken hostage within some dogmas/premises which pertinent will appear to be false. This perseverance on the one hand and on the other hand the aforementioned demand for multiple mind steps within a complex dynamics system almost shapes an impossible barrier to overcome and needs to be bridged in a very structural and meticulous manner.

In this quest I implicitly tried to reveal major parts of the explanatory model by appointing very specific motoric movement actions. That is why I started to explain the motoric movement action *marble run* in addendum 2 of *Caught In A Line*. Although the trajectory of the marble not becomes visible at any moment one is able to perceive the whole latent action trajectory shape of the marble beforehand and within more modern flexible marble runs one is able to adjust that latent action trajectory in any preferred shape. Within this action it becomes perfectly clear that the (movement) action object (MA) i.c. the marble indeed reveals the actual position of the marble but much more than that it shows the exact border between the manifest and latent action trajectory shape. This insight clearly reveals that a manifest action trajectory shape fills its latent part c.q. reveals that the vanishing of the latent action trajectory shape provides the τ -value, which will become zero, within the movement action (τ^G_{MA}). This implicitly provides us the insight of how we are capable of executing all interceptive c.q. catch actions because we are capable of determining the leading τ -value within an incoming *ball* trajectory shape to a previous cognitively determined (latent) catch point¹.

Besides the marble run the very specific motoric movement actions *pouring* and *writing* are explained as well. Conversely to most other motoric actions within the latter motoric movement action the action trajectory shape becomes completely visible. Or to phrase it in a different way, within writing the manifest part of the action trajectory shape remains visible while it disappears c.q. never becomes visible within most other actions. Of course the latter is the obvious main goal within writing and also in here the actual position of the tip of the pen marks the partition between the manifest and the latent part of the action trajectory shape. When the tip of the pen approaches the end of the (cognitively determined) perceptual image of (the line segment shape of) a letter, word or word part the writer will also perceive that the gap of the latent line segment shape will disappear c.q. will experience that the τ -value within the movement action (τ^G_{MA}) becomes zero and will align this with the following c.q. depending τ -value within the motoric movement (τ^G_{MM}) which will give the order from the *inside of the body* (!) just until the (*inside of the outside* (!) of the) tip of the pen to slow down till it finally has to come to a standstill at the end of the letter, word or word part.

¹ Within catching a ball with the hand the catch point is the intersection point of two line segment shapes which definitely need to be constructed beforehand as latent perceptual images. Otherwise one wouldn't be able to catch anything. The line segment shapes involved are 1. the line segment shape in which your hand is thrown and 2. the line segment shape in which the ball approaches.

The aforementioned motoric movement actions already present lots of novae and some complex mind steps. They for example clearly show that a perceptual image of a latent action trajectory needs to be shaped before any actual action is able to occur and that the actual position of the (movement) action object (MA) during the action fills that perceptual image with a manifest action trajectory shape. Of course this immediately ends the perception-action dichotomy within science by showing that it was never the question which of the two was more important within an action but that they compellingly need to be linked within an overarching phenomenon which shows that the final explanation is much bigger and much more complex than was ever assumed within science.

However how a (movement) action object (MA) fills a chosen action trajectory shape as part of an optimization process and that within there a crucial system, like the ventral and dorsal stream present us, needs to be located is still not becoming clear within the aforementioned motoric movement actions. So in the previous descriptions it doesn't become clear how for example the tip of the pen precisely reaches the end of the letter, word or word part during the actual writing. Maybe it occurred to you, at least if you still use pen and paper, that never one letter, word or word part was ever an exact copy of the other. First of all this has never been an issue as long as the letter, word or word part shows an *equal* shape within certain fluctuation boundaries and second it is just not possible to ever create the exact same shape because an optimization process is involved in which every time anew an action trajectory shape can only be adjusted indirectly with the *direct* (!) help of the other autonomous complex subsystem of the motoric movement (MM) because the explanatory model also provides the final insight that one motoric movement action can only succeed with the help of two foci. Maybe it sounds very awkward to you, although it reveals one of the very difficult needed mind steps, we aren't able to directly control the outside of the tip of the pen *as part of* (!) the action trajectory shape motorically. The movement on the outside of the tip of the pen within a letter, word or word part encompasses a completely autonomous complex subsystem within the successful execution of one motoric movement action. We are only capable of directly moving *the inside of* (!) the tip of the pen² from within the body with in fact very awkward and very weird body movements. It must be emphasized in here that those movements have nothing at all in common with the movements of the outside of the tip of the pen. This reveals the novum that we are only capable to visually perceive how the outside of the tip of the pen on the outside of the body moves within an action trajectory shape within the primary focus and that *simultaneously* (!) the secondary focus must be pointed at the proprioceptive perception³ towards the required motoric movements within the body. In which accordingly the novum is revealed that aforementioned visual and proprioceptive perception processes encompass completely different phenomena within one action and that the assumption/premise was wrong/false that they were part of one undivided motoric action.

Due to the fact that the movement action (MA) in which the actual production of the letter, word or word part in essence completes the task within an egocentric formulated will but can actually only indirectly be executed with the help of another autonomous complex subsystem i.c. the motoric movement (MM) the body of ecologically parsimonious developed organisms will need to host an important system that will take care that actions can be executed in an efficient and effective way. Because the (movement) action object (MA) can and will deviate from the perceptual image of the latent action

² This is possible because a pen encompasses a flexible (motoric) movement object (MM). Just like a tennis racket or a spoon/fork/knife.

³ The explanatory model also reveals the novum that we are capable of creating an action trajectory shape within the movement action (MA) and experience a *tau*-value just on basis of sole proprioceptive perception processes. We are for example capable of successfully executing many motoric movement actions in pitch black darkness. We are able to detect a keylock with the help of our two hands and to experience the closing of *the gap* between the tip of a key and the lock just on basis of those proprioceptive perception processes. So besides the already discovered phenomena of *limb position* and *movement* in regard to the proprioceptive perception processes the explanatory model adds a third important discovery.

trajectory shape it is preferable that the body hosts a double c.q. mutual system in which those deviations will be corrected.

“Although we have emphasized the separation of the dorsal and ventral streams, there are of course multiple connections between them, and indeed adaptive goal-directed behavior in humans and other primates must depend on a successful integration of their complementary contributions. Thus, the execution of a goal-directed action might depend on dedicated control systems in the dorsal stream, but the selection of appropriate goal objects and the action to be performed depends on the perceptual machinery of the ventral stream. One of the important questions that remains to be answered is how the two streams interact both with each other and with other brain regions in the production of purposive behavior⁴.”

“Much of our work to date has focused on the differences between the two visual streams – establishing where they go, why they are there, and how they work. This side of the story has depended crucially on evidence from patients who have suffered damage to one or the other stream. But even though studying the visual deficits and spared visual abilities in these patients has told us a great deal about the systems working in isolation, it has told us nothing about how the two systems interact. The big unanswered question for the future is how the two streams work together in all aspects of our visual life.⁵”

The explanatory model links this double c.q. mutual system to the scientific observations within research concerning the processing processes of the perception. The latter mainly encompasses revolutionary/ground breaking physiological scientific research in which again and again at the end the question rises how on earth it all works together at the functional level. Finally the explanatory model which introduces the existence of (perceptual images of latent and manifest) action trajectory shapes now provides the possibility to link the (movement) action object (MA) to a phenomenon which directly is capable of relating it what all physiological findings already suggest towards the function of it all. The explanatory model is even able to universally situate all those findings in a set and final way. So within the motoric movement action *writing* one is now able to mainly connect the ventral stream to (the processing of all perceptions concerning) the perceptual image of the whole (latent) action trajectory shape of a letter, word or word part and to connect the dorsal stream to (the processing of all perceptions concerning) the actual position of the tip of the pen within a letter, word or word part. However the explanatory model ranks the function of these cortical streams at such an important level because they only will have and are able to take care of the successful execution of the essence of the egocentric formulated will that the explanatory model hypothesizes that the two streams function within a double c.q. mutual system which over the years is more and more underpinned c.q. is in definite coherence with aforementioned physiological scientific research. So the explanatory model links the ventral stream mainly to the perceptual image of an action trajectory shape but in a definite relationship to the perception or the processing of the perceptions concerning the actual position of the (movement) action object (MA) and vice versa the dorsal stream will mainly perceive the actual position of the (movement) action object (MA) but in a definite relationship to the perception or the processing of the perceptions concerning the action trajectory shape.

The understanding of this mutual process can only lead to the conclusion that the filling of a latent action trajectory shape with a manifest action trajectory must be regarded as an optimization process. So within the motoric movement action *writing* of a letter, word or word part first a perceptual image of a latent action trajectory is cognitively shaped which the perceptions towards the dorsal stream than just

⁴ A. David Milner, Melvyn A. Goodale; School of Psychology University of St Andrews Fife, KY16 9JU Scotland, U.K; <http://www.theassc.org/files/assc/2367.pdf>

⁵ Goodale & Milner - The British Psychological Society - <https://thepsychologist.bps.org.uk/volume-19/edition-11/one-brain-two-visual-systems>.

will have to follow⁶. Deviations caused by the manifest action trajectory shape within the perceptual image of the latent action trajectory which will always occur will immediately have to be corrected within the ventral stream providing a new perceptual image of the shape of the remaining latent action trajectory and this will instantly have to be the next compelling guide for the dorsal stream until the next deviation occurs. This mutual process will only end when the (movement) action object (MA) reaches the very last part of the action trajectory shape when the *tau*-value approaches zero c.q. when it actually will fulfil the egocentric formulated will and within there reveals the universal optimization process within all imaginable motoric movement actions.

*“It takes about one-tenth of a second for information about the visual scene to reach the back of the brain or the occipital lobes. During the next tenth of a second, the visual information is analysed in two separate ways. Figure 2 shows the two pathways of the dorsal stream and the ventral stream. The dorsal stream runs from the occipital lobes to three locations, the back of the brain at the top (called the posterior parietal lobes), a vertical strip of brain in the centre (called the motor cortex) and the front of the brain (called the frontal cortex). The ventral stream runs from the occipital lobes to the back of the brain at the bottom (called the temporal lobes)”*⁷.

So within writing the tip of the pen “*jerkingly*” arrives at the end of a letter, word or word part. Again 1. because the letter, word or word part is indirectly created within the autonomous complex subsystem of the movement action (MA) that solely can (directly) be executed within the autonomous complex subsystem of the motoric movement (MM) which both only in a compelling relationship can lead to a successful execution of the whole motoric movement action and 2. because the dorsal and ventral stream have to cope with the *processing* (!) of the perceptions concerning the (movement) action object (MA) in relationship to the (movement) action trajectory shape (MA). The processing of those perceptions take some time and so before they can and will be corrected the chance is considerable that a deviation will occur within the action trajectory shape because at any point P the (movement) action object (MA) will be able to vary from the planned (latent) perceptual image P(+1) in numerous ways. In which again is stressed that this is not a problem at all as long as strict fluctuation boundaries of those deviations are involved. Which for example within the motoric movement action *writing* will have to take care of the *equal* (!) shaping of symbols which will need to host the opportunity that cognitively the same value will be attached to those equal shaped symbols which than only will make it possible that a written text can be understood. So within for example writing the execution of the exact same symbols has never been a goal at all. Within most *normal* motoric movement actions the main goal within ecological successfully evolved organisms indeed is that they are enabled to act quickly yet parsimoniously and so within for example the motoric movement action *grasping/grabbing* it is not important at all that the fingertips reach the handle of a coffee cup in an exact precise way but that the essence clearly beholds that our perception processes are only occupied with the goal to diminish c.q. reduce the number of places P between the fingertips and the handle as parsimonious as possible. In which process only at the end of the action trajectory shape the possibility needs to arise that the manifest action trajectory shape will hardly deviate from the perceptual image of the still latent part of that shape and this process from *precise global* to more and more *precise* is afforded because the chance to deviations will exponentially diminish with every advancing place P within the action trajectory shape. Or with other words during the actual c.q. factual execution of a motoric movement action we are *Caught In A Line*⁸ which we only are capable of crossing with the help of the processing

⁶ If one for example wants to grasp a coffee cup than at the start of the actual movement action (MA) one will have to throw the relevant fingertips in the beginning of the perceptual image of the latent action trajectory shape without any tactical considerations thrusting that the tactical movement action (MA) beforehand assessed that the end of that shape will reach the handle of the cup.

⁷ Cerebral Visual Impairment - Working Within and Around the Limitations of Vision; Gordon N Dutton; http://www.liv.ac.uk/~pcknox/Publications/trimble/CVI%20chapter%20for_hers-Dutton.pdf.

⁸ Within the description of the ball trajectory shape within for example the book “Watch The Ball Trajectory!” the final conclusion is formulated that the tennis ball indeed creates the actual c.q. manifest ball trajectory shape but conversely also is bound to follow the perceptual image of the latent shape that stems from the manifest part. So like the tip of the pen also actually creates the letter they are both caught in that line.

processes of the perception. So within your own empirical findings you are now able to verify why you never were able to construct an exact equal copy of one letter, word or word part and are now also able to examine that we walk or bring our fingertips to a light switch or a coffee cup in a “*jerking*” way. However in spite of the fact that we are able to verify this *shocking* execution within the affiliated action trajectory shapes within our own empirical experiences it subconsciously feels that we create straight line segment shapes and that is probably the cause that even scientific research pays attention to this subjective feeling. Conversely the explanatory model shows us that this can never be the case and therefore diligently looked for such a specific motoric movement action which implicitly would clarify the aforementioned jerking optimization process. Till now the best answer to this assignment was presented within the motoric movement action *nerve spiral*. This action shows an overlap with writing due to an obvious clear visible action trajectory shape. At first you think it is a very rare kind of action but when you observe it closer it just encompasses the motoric movement action *touching/taking/grabbing/grasping etc.* which without any doubt we execute most in our lives. For example the motoric movement action *eating* comprises such an action and will convince you right away that we often execute it and besides that it shows the immediate overlap with the motoric movement action *nerve spiral* because within eating we also use a flexible (motoric) movement object (MM). Just like the ring within the motoric movement action *nerve spiral* the bowl of the spoon, the prongs of the fork and/or the cutting face of the knife can be manipulated freely (flexible) along an action trajectory shape at around the same distance from the fingertips.

Of course the main difference is situated in the fact that the nerve spiral demands the execution of one precise set action trajectory shape which has the consequence that the tactical movement action (MA) can only come forward with almost the exact same perceptual image of the latent action trajectory shape which we always need beforehand before it will be executed during the actual movement action (MA). At the same time you are able to witness that within the game which goes along with the motoric movement action *nerve spiral* a challenging diameter ring-spiral ratio is used that allows players to successfully cope with the deviations within the actual manifest action trajectory shape in comparison to the actual spiral c.q. that those deviations will not lead to the ring touching the spiral. Therefore it is recommended that within scientific research a completely straight nerve spiral will be used but that the diameter ring-spiral ratio is minimized as much as possible. Then it will appear that no mere mortal will be able to move the ring from A to B without letting the bell ring. Even when one moves the ring as slow as one is able to do. With a *usual/normal* velocity (like within writing, taking, eating etc.) and a distance A-B present within the above shown nerve spiral one will touch the spiral even multiple times. It can't be otherwise because this is the *natural* way. We are only able to indirectly correct the movement of the ring within a line segment shape with the help of the processing processes of the perception.

2. Introduction to the motoric movement action *nerve spiral*

The motoric movement action *nerve spiral* can be categorized under sports or games. The small version of the game which can be obtained in toy stores can be executed in the living room. Large versions used to be a familiar phenomenon in earlier Dutch televised game shows. The game idea of the motoric movement action *nerve spiral* dictates a player the task to guide the eye of a metal ring over a trajectory of a metal spiral from A to the endpoint B without letting the ring touch the spiral. The ring is situated at the end of an elongated metal bar from which the handle is isolated and the eye of the ring is linked to the spiral in such a way that it can't be removed c.q. that it will always touch the spiral if you want to separate the ring from it. The of course metal substances of the ring and the spiral are connected with a power supply in such a way that an electrical current will occur if they touch each other which in order will trigger a loud ringing bell. So with other words the goal of the game is to guide a ring from A to B without triggering the bell c.q. without letting the ring touch the spiral and so if one decides to play the game one develops the egocentric formulated will to achieve that goal.

The revolutionary essence of the explanatory model encompasses the fact that the execution of one motoric movement action, any motoric movement action, allows a strict division in two completely autonomous parts. However the obligatory conclusion arising from this affirmation comprises that any

motoric action needs to be assessed as a complex system and only can be executed due to an obligatory cooperation of those two autonomous complex subsystems. Although science regards this observation bizarre, they still behold one undivided action in relationship to just one existing focus, the explanatory model conversely shows that final insights can be achieved because any motoric action allows this strict and universal division into two autonomous components each demanding a separate focus.



Images: Within writing (left) as well as the nerve spiral (middle) and the marble run (right) the (movement) action object (MA) i.c. respectively the tip of the pen, the ring and the marble within a perceptual image marks the division between the manifest and latent part of the action trajectory shape just like within all motoric movement actions. In which with other words the actually to be perceived place $P(0)$ of that action object marks the exact division between the passed positions $P(-x)$ and the near future positions $P(+x)$ of that exact same object which are essential to successfully fulfil the task demanded within the egocentric formulated will. In that way the explanatory model shows that line segment shapes of consecutive places P always occur, because the place $P(0)$ must always be connected to the places $P(-1)$ and $P(+1)$, which are constructed within perceptual images and that the factual image of the actual spot of the (movement) action object in a set relationship will always be a part of that line segment shape in which the object will finally has to fill the whole latent part of the action trajectory shape. So within this process two completely separated phenomena can be observed. In which one elucidates the perceptual side and the other the actual side which together in an overarching entity completely clarify how and where the perception-action coupling needs to occur within every imaginable motoric movement action. The aforementioned motoric actions are rather unique because they involve visible action trajectory shapes. At least within the nerve spiral and the marble run one can observe the manifest and latent part continuously and within writing the manifest part remains visible. Within the majority of motoric movement actions the action trajectory shape never becomes visible. So the explanatory model indicates that this entity, hosting the perception-action coupling, executes the essence of the task within the egocentric formulated will and therefor clarifies that the primary focus must be pointed at this coupling process. In which it also shows that we are only capable of passively observing this process and only are capable of manipulating this process motorically with the help of another autonomous simultaneous occurring phenomenon within the motoric movement action. Hence it shows that the movement of an (movement) action object within an action trajectory shape, in which a manifest line fills a latent line segment shape, can only be regarded as an optimization process in which the explanatory model also shows that this optimization process can only be achieved due to the mutual relationship and the cooperation of the dorsal and ventral stream which are handed to us within current scientific research thereon. This mutual process clarifies within every imaginable motoric movement action that action trajectory shapes are executed “shockingly” or “jerkingly” and that is what the motoric movement action *nerve spiral* so plastically shows.

Accordingly the explanatory model shows that the essence of the task within the motoric movement action *nerve spiral* beholds the fact that a ring, and only the ring⁹, needs to be transported from A to B

⁹ This demands a complex mind step. Finally a letter trajectory shape needs to be executed by a mailman but if you want to get a grip at the two involved autonomous complex subsystems you will have to start to understand

(along an action trajectory shape i.c. the very visible spiral). So although this task is formulated out of an egocentric formulated will this one part of the action is in essence only executed by the ring¹⁰. The ring alone will shape its action trajectory line segment shape with all its consecutive positions P. Just like a ball within every ball game, the ink during the motoric movement action *writing*, the food during the motoric movement action *eating*, the outside of a fingertip¹¹ within the motoric movement action *grasping/touching etc.* the ring is regarded as a fully autonomous entity within our perception processes. We don't share anything with the ring, we are not the ring and we don't have or will ever have anything in common with the ring. We are going to move the ring as a consequence of an egocentric formulated will but the movement action (MA) must be linked to the (movement) action object (MA) and not to any phenomenon belonging to the ego. Conform J.J. Gibson the (movement) action object (MA) expresses the relationship *between* (!) the animal and the environment¹² and nothing belonging to the animal or the environment itself.

However the ring doesn't do anything by itself. Without a ring you aren't able to play the game but if we don't pick up the ring nothing will arrive in B either. Just like in all other motoric movement actions we will have to move the lifeless, dead, ring outside of our body with movement trajectory shapes from within the body which we conversely are able to control directly. So the motoric movement action *nerve spiral* is only able to succeed if we point one focus (the primary focus) on the essence within the task, the *ring* line segment shape, and at the same time point a completely other focus (the secondary focus) on movement trajectory shapes within the body towards the execution of the movement action (MA) c.q. towards the primary focus. So in summary within any motoric movement action our perception processes within the movement action (MA) are solely engaged with the (movement) action object (MA) out of the perspective of that object and our perception processes within the motoric movement (MM) are solely engaged with the *execution* (!) of the movement action (MA) by and within (out of the perspective of) the body and not with the ring at all. Ergo the movement action (MA) is solely occupied with the (visual) perception of the movement of the ring along the spiral (outside of the body) and the motoric movement (MM) is solely occupied with (proprioceptive) perception of movements (within the body). So we are only capable to visually perceive the movement of the ring within an action trajectory shape and are only capable to manipulate that movement indirectly by producing rather awkward body movements which have no relationship whatsoever with the action trajectory of the ring. It is necessary that you start to see that the autonomous movement of the ring can only be influenced by a completely other autonomous moving process¹³.

that within one action one part of our perception processes is solely pointed at the position of the actual letter and that the another part of our perception processes is solely pointed at the physical manipulation towards all those places P of the letter.

¹⁰ It is like the flow of the water within a mountain stream. Only due to moving rocks we are able to manipulate the direction of the water. We just never will be able to manipulate *autonomous* matter in any other way. The very complex next mind step that stems from that idea is the fact that even the outsides of our body need to be considered as such. We for example are only able to manipulate the *outside* (!) of our fingertips within an action trajectory shape on the outside of our body with inner body movements just till a very close point of the outside of those fingertips. But they will always remain within our body/fingertips.

¹¹ See *Caught In A Line* – Addendum 2: The motoric movement action grabbing/grasping/touching etc.. The outside of our fingertips indeed belongs to our body. It is made from living tissue but we are not able to consciously direct it as a part within an action. We are only capable of manipulating the outside of a fingertip just from the inside of the body until close to the outside of that fingertip. Ergo the outside of a fingertip can only be manipulated within an action trajectory shape on the outside of the body with movement trajectories on the inside of our body.

¹² With this third entity the explanatory model finalizes Gibson's *The Affordances Theory*. It shows that not only the environment affords the action but that it depends as much on the available movement space between those two phenomena.

¹³ It is like the flow of the water within a mountain stream. Only due to moving rocks we are able to manipulate the direction of the water. We just never will be able to manipulate *autonomous* matter in any other way. The very complex next mind step that stems from that idea is the fact that even the outsides of our body needs to be considered as such. We for example are only able to manipulate the *outside* (!) of our fingertips within an action trajectory shape on the outside of our body with inner body movements just till a very close point of the outside of those fingertips. But they will always remain within our body/fingertips.

3. The movement action (MA) of the motoric movement action *nerve spiral* – The primary focus

So the explanatory model clearly reveals that in an universal way every motoric action can be divided in two autonomous complex subsystems. The movement action (MA) and the motoric movement (MM). Within the movement action (MA) itself which is only occupied with the movement of the (movement) action object (MA) within the (movement) action trajectory out of the perspective of the object the explanatory model appoints three components. They are: 1. the cognitive basis, 2. the tactical movement action and 3. the actual movement action. The first two parts encompass the tactical department and mainly have the goal to come forward with a perceptual image of one latent action trajectory shape out of multiple options before any actual execution will occur. Every day we execute many motoric movement actions in which we move our body, a body part or a (movement) action object (MA) from A to B. So we possess a huge cognitive basis of knowledge how to get from A to B. Ergo this knowledge comprises a huge arsenal of *shapes* (!) of reference action trajectories in which also a lot of abstract knowledge of inflexion points, timing, length, duration etc. is stored.

Within most *normal* motoric movement actions this department is very active but it obviously has little to construct within the motoric movement action *nerve spiral* because within that action a compelling action trajectory shape needs to be executed. So the difficulty of this motoric movement action has no relationship with these *tactical* components because we are able to construct a perceptual image of the latent action trajectory shape easily. However it must be noted that persons with a lot of experience concerning the motoric movement action *nerve spiral* within the tactical movement action (MA) translate their broad knowledge of spirals to the specific spiral now in front of them.

The difficulty within the motoric movement action *nerve spiral* must be linked to the actual movement action (MA) in which we actually move the ring along the action trajectory shape from A to B. Then we are not able to quickly start to actually construct a *precise global* action trajectory shape which only needs to become more and more precise at the end of the action trajectory like we are allowed to do within almost all other actions but within the motoric movement action *nerve spiral* the action trajectory shape needs to be constructed very precise from the first beginning to the very end. The explanatory model of the motoric movement action indicates that we are only capable of following the (movement) action object (MA) filling the action trajectory shape with the help of the processing processes of the perception¹⁴ and only are capable of actually manipulating that process with the help of the other autonomous complex system of the motoric movement (MM). The explanatory model shows crystal clear that the filling of the action trajectory shape by the (movement) action object (MA) can only be considered an optimization process which we are only able to perceive and are only able to execute indirectly. The ventral stream will mainly have to process all perceptions towards a perceptual image of the whole (movement) action trajectory shape but definitely will have to keep a relationship with the actual position of the (movement) action object (MA). The dorsal stream will mainly have to process all perceptions towards the actual position of the (movement) action object (MA) but definitely will have to keep a relationship with the perceptual image of the whole (movement) action trajectory shape. With this mutual c.q. double process the explanatory model shows that the ventral stream needs to come up with *new* perceptual images of *new* latent parts of the action trajectory every time the dorsal stream signals a deviation within the latent perceptual image due to the manifest action trajectory shape and the dorsal stream will just have to follow this new perceptual image unequivocally just until the next deviation occurs. So the explanatory model concludes that if we didn't possess those processing processes of the perception we would never be able to execute actions successfully. So in the optimization process in which in other words a perceptual image of a latent action trajectory shape is *jerkingly* filled with a perceptual image of a manifest action trajectory shape the only outcome will be that mere mortals will touch the spiral with the ring numerous times within the motoric movement action *nerve spiral* and the conclusion can be that within all motoric movement actions

¹⁴ If you want to execute the motoric movement action *nerve spiral* successfully you will definitely have to rely on superior visual processing processes. However the explanatory model shows that the cortical streams are very well capable of processing auditory perceptions like scientific research already confirms. Besides that the explanatory model introduces the novum that the two processing processes of the perception can also be actuated proprioceptively.

perceptions of deviations are indeed processed due to an ingenious system but which will never show one exact copy of an action trajectory shape due to the processing time involved.

a. The τ -value within the movement action (τ^G_{MA}) of the motoric movement action *nerve spiral*

The actual spot of the (movement) action object (MA) like the ring within the motoric movement action *nerve spiral* shows the exact partition of the manifest and latent part of the action trajectory shape. Just like the marble shows within a marble run. Only if you will start to realize that the manifest part is filling a latent part of an action trajectory shape until the latent part disappeared completely and that our perception processes are mainly occupied with this phenomenon only then you will be able to gain insight in how the τ -value of the movement action (τ^G_{MA}) is perceived c.q. must be observed. The τ -value of the action trajectory within the movement action (τ^G_{MA}) can only be determined by observing how the manifest part of the *ring* trajectory/line segment shape closes the perceptual image of the latent part of that *ring* trajectory/line segment shape.

With the term line segment shape the explanatory model shows the two words *line* and *shape* which are exactly the two phenomena which must be appointed within a sound ecological explanation. Ecological explanations need to cover the evolution of the earliest organisms but also need to explain the apparent differences within higher/later ranked organisms. The explanatory model links the basal part to the word *line* and ongoing cognitive developments to the word *shape*.

For the τ -value towards the timing within the movement action (MA) one only needs to observe one-dimensionally¹⁵ how the (alleged) line segments relate to each other and so one doesn't have to exactly observe what the *shape* of that line exactly beholds. This basal functioning of our perception processes can ecologically be linked to the earliest organisms. Evolution of cognitive knowledge about *the shape of the line* (!) can be observed within higher and later ranked organisms which will provide them a more secure determination of the τ -value. So conform D.N. Lee you could suppose that for the construction of the τ -value one only needs to observe how the gap between the ring and the end of the spiral approaches zero within the motoric movement action *nerve spiral*. This simple linear gap for example becomes very transparent within the motoric movement action *pouring*. When you fill a glass with a liquid you only one-dimensionally observe how the actual surface is rising towards the rim of the glass¹⁶.

4. The motoric movement (MM) of the motoric movement action *nerve spiral* – The secondary focus

So the explanatory model clearly reveals that in an universal way every motoric action can be divided in two autonomous complex subsystems. The movement action (MA) and the motoric movement (MM). The description of the aforementioned movement action (MA) already shows that the final explanation is far more complex than ever was assumed within science. Accordingly it shows many complex elements with many perception processes but conversely also shows that one is able to simply execute them at the functional level. Now the whole explanation becomes even more complex because the explanatory model indicates that the movement action (MA) can only be perceived

¹⁵ The explanatory model shows within *Caught In A Line* and the eponymous addenda that the term line segment shape hosts two essential components. The basal word *line* can ecologically be linked to the development of the earliest organisms and shows that the τ -value within the movement action (τ^G_{MA}) can be perceived one-dimensionally by the blunt observation that a line is filled without ever having to know any detail of the shape of that line. With the word *shape* the explanatory model appoints the cognitive element that conversely separates higher from lower ranked organisms. Due to this revelation the explanatory model is able to explain why even toddlers are able to hit tennis balls because they are already capable to perceive the one-dimensional filling of a line and to perceive the corresponding basal τ -value becoming zero. However it will take more than a decade of hard practice before they will be able to distinguish most of the relevant ball trajectory shapes in tennis and to tactically approach them in the right way.

¹⁶ Within the motoric movement action *pouring* this τ -value can clearly be observed twice. The first time this happens when the arch of the liquid reaches the glass but the second time makes an even better example. When the liquid is filling the glass we only need to perceive the rising of the level of the liquid till the rim of the glass one-dimensionally. When we observe that the gap between the actual level and the desired level disappears then the motoric movement (MM) will receive the signal to slow down the pouring.

(indirect) and solely can be executed directly/motorically with the other autonomous complex subsystem which provides the novum within the movements sciences that a secondary focus must be present within every motoric movement action. Of course it could never have been regarded different and this encompasses one of the major flaws within science. Within the movement action (MA) one needs to perceive everything out of the perspective of the (movement) action object (MA) i.c. the ring within the motoric movement action *nerve spiral* and within the motoric movement (MM) one needs to perceive everything *within the body until the ring* out of the perspective of the acting organism.

The explanatory model shows¹⁷ that the motoric movement (MM) in principle hosts three complex subsystems. They are: 1. the body processes (BP), 2. the body movements (BM) and 3. the individual condition (IC). They are autonomous complex systems themselves and the product of the three needs to be optimized when you want to reach the highest outcome within the motoric movement (MM) towards the the movement action (MA) in for example sport performances. So they are also present within the motoric movement action *nerve spiral* but one can easily see that within there they do not become relevant at all. 1. You don't need any stamina/endurance (BP) to execute the motoric movement action *nerve spiral*, 2. you don't need or will have to consider a technique model (BM) within the motoric movement action *nerve spiral* and 3. the individual conditions (IC) don't need to be optimized as well within the motoric movement action *nerve spiral*.

So although the whole motoric movement action *nerve spiral* must be assessed as very complex the motoric movement (MM) remains very simple at the functional level. Just like the the movement action (MA) and that is why we are able to execute this motoric movement action in complete flow¹⁸.

The motoric movement (MM) within the motoric movement action *nerve spiral* even remains very simple when you consider that the action becomes more complex due to the use of a flexible (motoric) movement object (MM)¹⁹. The ring attached to an elongated metal bar adds an extra movement trajectory to the motoric movement (MM). The ring/bar can be manipulated freely/flexible and therefore the movement trajectories within the body will have to create a unity with it. But in spite of this remark the movement technique remains simple and mainly concerns hand, wrist and arm movements.

Of course it is a little more complex than that but that is not relevant. The only thing important in here is that you start to understand that we are only able to manipulate the movement of the ring along an action trajectory shape with these, much different, motoric movements. The ring (the movement object) is a lifeless substance and is doing nothing and will never do anything. So the movement of the ring along an action trajectory shape will always have to be executed somewhere else. The movement trajectories are linked to the motoric movement (MM). The action trajectory is linked to the (movement) action object (MA) within the movement action (MA). They are not able to show any overlaps because their perspectives belong to two irreconcilable worlds.

So the technique isn't elaborated any further because it is all too simple within the motoric movement action *nerve spiral*. However two matters within the motoric movement (MM) need to be clarified because they will have to show how the secondary focus is present within the motoric movement action *nerve spiral* and which will have to show the link with the *tau*-value within the motoric movement (τ_{MM}^G) which is crucial within the functional *tau*-coupling of the whole action.

a. The secondary focus in relationship to the transition point

So with the novum of two simultaneous existing foci the explanatory model also reveals the novum that within every motoric movement action in general the secondary focus must be pointed at the biomechanical main action within the motoric movement (MM) towards the action trajectory shape c.q. the primary focus. This is formulated like this because in very complex movements, like a tennis service or a long distance golf swing, one is not able to avoid paying a profound part of attention to aspects of the motoric movement (MM). In simple actions like within the motoric movement action *letter posting* or *nerve spiral* that is completely needless. We don't have to pay any conscious attention to a specific letter or ring moving technique.

¹⁷ Within *Caught In A Line* and within Addendum 1 and 2 of *Caught In A Line*.

¹⁸ Read: *Caught In A Line*

¹⁹ See: *Caught In A Line*; p. 52.

So within the motoric movement action *nerve spiral* we don't have to focus consciously at any motoric movement but at a subconscious level it must be linked to the primary focus. The explanatory model shows that this linking always occurs in one specific point. This is defined as the transition point. The transition point is the point where the movement action (MA) and the motoric movement (MM) come together or to put it in other words it is the point where they *transition* which the transition point literally indicates.

Within the motoric movement action *nerve spiral* the two complex subsystems transition within the point *between* (!) 1. *the metal* (!) of the ring at the end of the elongated metal bar and 2. *the air* (the void) (!) of what the metal of the ring encloses. So the ultimate spot we are able to manipulate directly within the motoric movement (MM) is situated immensely close to the transition point but will never show an overlap with that transition point. The inside (the void) of the ring is part of a line segment shape, outside of the body, between a random start and end point of a nerve spiral within the movement action (MA) and it can only be executed by the motoric movement (MM) which is only capable to manipulate movement trajectory shapes within the body *just until* (!) the transition point. So even though a technique c.q. the motoric movement (MM) must be considered as very simple within a motoric action the secondary focus, conscious or not, must always have to be pointed at movements within the body towards the transition point while simultaneously the primary focus must be pointed at the action trajectory shape within the the movement action (MA) outside of the body.

b. The τ -value within the motoric movement (τ_{MM}^G) of the motoric movement action *nerve spiral*

Now within *self-paced* motoric movement actions like the motoric movement action *nerve spiral* the next phenomenon occurs. The action trajectory shape and within there the τ -value concerning the timing of the movement action (τ_{MA}^G) is constructed by all consecutive places P of the *opening* (!) of the ring. It is very important to stress in here that the movement action (MA) is only concerned with this opening of the ring and so only the opening shapes the action trajectory and determines the τ -value within the movement action (MA) and it is important to understand that it has no relationship with the transition point. Conversely the τ -value within the motoric movement (τ_{MM}^G) is constructed by all consecutive places P' of the transition point within the secondary focus in which the place P' encompasses the metal part *around the opening* (!) of the ring²⁰. Because the ring doesn't get separated from the elongated metal bar the places P and P' will maintain to be close to each other²¹ during the complete action. They relate to different gaps within two completely different phenomena but their τ -values can be observed as one because they fill an exact similar gap within a line segment shape in an exact similar way. Or within other words the perception of the gap of the movement action (MA) automatically provides information about the gap of the motoric movement (MM). So in these kinds of (*static*) motoric movement actions one is able to say that there is an equalization of gaps. This implies that you are able to pause the action trajectory at any moment when you for example need to sneeze. The pausing of the gap of the action trajectory will automatically pause the gap within the motoric movement (MM). If you resume the movement action (MA) then the perception of the gap within the motoric movement (MM) will be resumed simultaneously and will continue with the movement of the ring till the leading τ -value (τ_{MA}^G) will approach zero. Although in common language this isn't called timing you are now able to understand that self-paced actions are timed as well. This phenomenon can be regarded as *self-paced* timing. If the visual perception processes observe that the τ -value of the movement action (τ_{MA}^G) approaches zero then the τ -value within the motoric movement (τ_{MM}^G) is guided in such a way that it also approaches zero.

²⁰ In for example the motoric movement action *catching* this transition point trajectory is a really different line segment shape than the action trajectory.

²¹ So for all clarity our primary focus during letter posting is only observing the movement of the letter. That includes the τ -value of the letter trajectory. At the same moment our secondary focus is observing the transition point where we hold the letter. As aforementioned we do that out of a certain technique but that doesn't need special attention. But it does need attention though. So during posting you visually observe all points P of the letter towards the slit of the mailbox and at the same time you proprioceptively observe all points P' of the transition point out of the movements within your body.

However within this kind of static actions like within the motoric movement action *nerve spiral* or within the two first phases of the motoric movement action *letter posting* the τ -value of the motoric movement (τ_{MM}^G) is hard to grasp. However with the explanation of the τ -coupling within the (tiny) throw of the letter within the non-static last phase of the motoric movement action *letter posting* the τ -coupling within static actions become crystal clear as well. We need to close the relevant fingertips during the holding on to the letter in the first two phases of this action *as active as (!)* we need to open them simultaneously²² within the throwing phase. Within our subjective feelings we only regard the opening of the fingers as a genuine motoric *movement (!)* action but the static holding must be considered as active within a *zero-movement (!)*²³.

“However as aforementioned the timing is not really relevant in the first two phases of the motoric movement action letter posting because within there we hold on to the letter constantly. In the final phase of the letter posting when the letter is actually inserted into the slit of the mailbox the τ -coupling becomes more significant c.q. transparent. Even this tiny throw needs a τ -coupling²⁴. Although in here a very small distance A-B is involved a small energy transfer is needed and therefore a small initial phase needs to take place. The τ -value of the movement action (τ_{MA}^G) is now determined by how the letter fills the small line segment A-B of that initial phase. The τ -value of the transition point towards that action trajectory within the motoric movement (τ_{MM}^G) will have to follow this leading gap and will have to provide the message to the motoric movement (MM) to completely (!) release the letter from all the relevant fingertips once the letter reaches the end of the perceptual image of that latent letter action trajectory shape in B. So with other words if we perceive that the τ -value of the movement action (τ_{MA-A-B}^G) approaches zero then the τ -value of the motoric movement (τ_{MM-A-B}^G) also has to approach zero and gives the order to take all fingers of the letter at the exact same moment at all transition points.

In that way the τ -coupling can be brought back to the primary and secondary focus. The primary focus in a throwing task must be pointed at the initial phase of the action trajectory shape and especially at the previous determined end point of that initial phase. The secondary focus in a throwing task must be pointed at the transition point towards that action trajectory shape out of the perspective of the throwing technique belonging to the motoric movement (MM).²⁵”

So we continuously perceive the τ -value of the motoric movement (τ_{MM}^G) within the motoric movement action *nerve spiral* within all time frames of the whole action during the pushing of all relevant fingertips around the handgrip of the elongated metal bar. In the explanation of the motoric movement action *grasping/grabbing etc.* you are able to read the explanation that within holding with the hand the relevant fingertips need to create pushing-vectors in such a way that a zero resultant must be perceived within the flexible (motoric) movement object (MM). By the way every day you are able to witness this multiple times within your own empirical experiences during the motoric movement action *eating* within the use of a spoon, fork or knife.

5. The complete motoric movement action *nerve spiral*

Due to the comprehensive separate description of the two only organs of the motoric movement action the suggestion could arise that they are linear or otherwise separated processes. That is a complete misconception. Both organs are part of one undivided complex system. The explanatory model explains the motoric movement action as a complex system. The description of the motoric movement

²² Read: “simultaneously within certain fluctuation borders” because you can’t, never will be able or ever released your fingertips from the letter in the exact same constellation.

²³ Within the motoric movement action *grasping/grabbing etc.* the whole spectrum of obligatory linked *touch* and *push* actions are revealed.

²⁴ The essence of a throwing task is that the (movement) action object (the letter) must pertinently be held over a certain (very tiny) line segment A-B in which the initial phase of the object trajectory will be shaped. That initial phase is essential for the upcoming or near future shape of the action trajectory and for the transfer of energy. When the action object approaches B the body parts which hold the object will have to receive the message to release from the object at the exact same time.

²⁵ Excerpt from the motoric movement action *letter posting*.

(MM) and the movement action (MA) only concerns the explanation of the two complex subsystems. During the execution of a motoric movement action they need to be executed and they need to be perceived simultaneously. The explanatory model explains which perception processes in both parts are required and out of which perspective they need to be observed.

The explanatory model is connecting the processing processes of the perception to the movement action (MA) and proprioceptive perception to the motoric movement (MM) but it doesn't exclude that some perception processes show overlaps. So within the motoric movement action *nerve spiral* the primary focus needs to be pointed at the movement of the ring within a kind of set marble run and at the same time the secondary focus must be pointed at the biomechanical main action towards the transition point within that action trajectory shape which will *execute* (!) the movement action (MA). Like aforementioned both foci produce a *tau*-value which is essential for the completion of the functional *tau*-coupling within the whole action.