Towards a Possible Approach to Meta-systems as Escapements

On a Simple Geometrical and Algebraic Representation of Emergence

Kent D. Palmer, Ph.D., Joseph Kasser, Ph.D.

P.O. Box 1632
Orange CA 92856 USA
714-633-9508
palmer@exo.com

Started 04/19/04; Version 0.03; 04/21/04; jk00a03.doc

Keywords: Systems Engineering, Systems Theory, Meta-system, Infra-system, Proto-gestalt, Proto-flow, escapement, scape,

Introduction

I gave my paper at the CSER conference at USC on April 15th, 2004. At that conference was Dr. Joseph Kasser[1] one of the professors at SEEC which is part of UNISA. I was happy that someone from the school was there to hear me give my paper since my own advisor Tim Ferris[2] could not attend. I kidded Dr. Kasser that I had told Tim that he should tell them back at the school that he had a student that had gone astray and that needed straightening out, and that he should come to the conference to straighten me out. So I said to Dr. Kasser that it was now his job to straighten me out. Those turned out to be fateful words in jest.

We both attended the conference and our paths intersected occasionally. But during the conference I asked Dr. Kasser if he could come visit me on Saturday at my home. He agreed and said he would come on Saturday after noon. On Saturday April 17th he arrived about 2pm an stayed until about 9pm. During that time we had a very intense discussion about the meaning of the word meta-system that led to some unexpected results for both of us. This paper will attempt to capture the gist of that conversation. Much of the conversation was recorded by Dr. Kasser and this is written without the help of that recording. This will be my attempt to make sense of what Dr. Kasser and I learned together that day so I can capture it and attempt to verify that it is indeed a significant finding. We agreed to write a joint paper about the result if it turned out to be significant. This working paper should be considered the first step in the writing of that joint paper. I think that the fundamental insight here was Dr. Kasser's. But it came in response to the problem of the definition of the term meta-system and so it came out of the interaction of the unique perspectives we brought to the discussion. As I tried to get across my meaning of the term "meta-system" that opened up a realization on the part of Dr. Kasser that surprised both of us because we had not heard it this exact vision of the meaning of emergence nor representation of it in either of our readings of the literature. I felt suddenly as if my whole way of looking at Systems Theory as being turned over and I am still not sure of the long term consequences on my thought of this insight if it proves to be significant and valid. I had given a paper about emergence and the meta-levels of emergence the day before. That Saturday I felt as if I were experiencing an emergent event as my thought suddenly was transformed by a very simple diagram which was interpreted in terms of the concept of emergence. It was a very strange experience. I felt as if my thinking were being straightened out in a very fundamental way, so that my joke of the day before was becoming real in a way that was utterly unexpected. I am

[1] http://www.unisanet.unisa.edu.au/staff/Homepage.asp?Name=Joseph.Kasser

[2] http://www.unisanet.unisa.edu.au/staff/Homepage.asp?Name=Timothy.Ferris

still working out the significance and validity of this way of looking at emergence and systems. I do not know whether I accept this new vision of systems and emergence yet.

Semantic Difference

As with many key ideas which change our ways of looking at things they turn out to be extremely simple and straight forward after the fact, while impossible to see prior to their emergence. Here the basic discussion was revolving around the term "meta-system". Dr. Kasser saw this as the next level up from the system in the series sub-system, system and meta-system. I called that the super-system. I explained that in my vocabulary the meta-system is the inverse complement of the system, as its environment, context, situation, ecosystem, operating system, medium, universal turing machine, etc. There is no good word for this in our culture as there is for other schemas in the schematic ontological hierarchy I have identified and have tried to study. I am dissatisfied with the term. I have tried to find a better term and failed. He did not like my use of what he perceived as a traditional term with an established usage misused. It is true that some theorists had used the term in the way he suggested was correct but that usage had faded and now the community of scholars tended to talk of system of systems. That suits me because I recognize that there is a hierarchy of recursive uses of the system on itself, but believe that the meta-system in my use emphasizing the meaning of "meta" that signifies what lies beyond is a completely different schema that is the complement of the system.

So I drew a diagram with concentric circles and each circle surface I called a system and each gap between circles I called the complementary meta-system. Dr. Kasser drew a diagram with a hierarchy that assembled sub-systems into systems and systems into his use of meta-system and said that the system of systems view was orthogonal to this hierarchy looking across it rather than up to the meta-system/supersystem. I kept saying that the meta-system is a whole less than the sum of the parts while the system is a whole greater than the sum of the parts. At least we agreed that systems were projected schemas and not something out in the world. Then I drew a diagram that had a system circle and within it several sub-system circles. Then I said that the meta-system was the gap between the lines of the subsystems and the lines of the system. At this point Dr. Kasser looked at the diagram that I had done and said that the gap between the subsystem circles and the system outer circle was the emergent whole greater than the sum of its parts. Then I said that this meant we could write an equation where we said that the System = sub-system1 area + subsystem2 area + subsystem3 area + subsystem4 area + the gap between the lines demarking sub-systems and the outer system line. The gap equals the emergent part that was greater than the sum of its parts. That was what was missing from the equations that Wayne Wymore was presenting just the day before. It is this gap that is left out of all systems and formal equations, it was the embodiment in a mathematical form and geometrical form of what I had been calling the emergent excess or lack in my briefing on the preceding Thursday. Suddenly we were both looking at the diagram and the equation I had written and saying that no one that we knew of had ever said that before. Of course, a search of the literature needs to be made, but to my knowledge this has not been pointed out previously and it is so simple and intuitive. The gap between the outer circle that represents the system and the inner subcircles that represent the subsystems is the emergent excess, i.e. that part that is over and above the sum of the parts. And this can easily be represented in an equation as a delta, like the delta in calculus, but as an unknown difference that is equal to the emergent properties of the emergent whole. The fact we can see this emergent excess in a simple non-Venn diagram and we can represent it in an equation as an unknown variable means that we can bring to bear very simple arithmetical and geometrical reasoning to think about emergence which I am not sure has ever been recognized before.

Dr. Kasser went on to draw another diagram in which there were parts but no gap and I said that this would be an example of a system that

is neither emergent nor de-emergent. Then at that point I started explaining the special systems theory and we began to try to understand how special systems might fit into this way of looking at things. What we realized was that special systems could be seen as a gap within the gap. There is a distinction between the gap and the lines that represent the surfaces of the systems. Special systems says that there are three kinds of gaps within the gap. There can be overlap, perfect coincidence, or non-contact between the gap edge and the lines of the system. It is as if a gap had thickness and that thickness could vary in three different ways. This seemed like a way of talking about the various ways that the distinction between gap and system surface might be related that was like the special systems, and thus we talked about that as the problem of the possibility of a gap within the gap. What I liked about this is that it gave me a way of talking about the special systems in ways that might be significant to Systems Engineers because we can change the terms of the conversation by interpreting these diagrams we were drawing to speak about functionality and behavior of the system and states like over-design, under-design, etc. At the system level a design might exceed, meet or exhibit a lack in relation to the requirements. But in the system at the sub-system level this might appear as over-design, a design that was perfect, or under-design. Another possibility was were there was just hole in the design, and that was another possibility rather than merely a niche were a sub-system should fit. This led to the discussion of the fact that in terms of meeting requirements one could either meet them in the subsystems only or in the emergent excess, and thus there were two types of excess just as there were two types of possible holes in system functionality, a niche for subsystems, and just a lacunae. I told Dr. Kasser that this coincided with what was known from an analysis of the Game of Wei Chi (Go) which is a model of the Emergent Meta-system which has two kinds of holes and two kinds of positive elements. Thus there is a complemetarity between two kinds of surplus and two kinds of lack. There is the surplus outside the subsystems and the surplus within the subsystems. There is the lack when you take out a subsystem to produce a niche and a lack which is just a lacunae. When you go into the gap within the gap you are going more deeply that either these excesses or lacunae to consider the difference between the gap (meta-system as environment) and the surface of the subsystems or systems. My point was that the space between the surfaces of sub-system, system, and super-system was an environment or meta-system. That gap was the dual of the nested surfaces themselves. But Dr. Kasser's point was that this only was meaningful looking out from what ever level we were talking about as the context of the system level. I had to concede this point and asked what was the same thing looking in the other direction and it was at that point that we looked at the diagram I had written with sub-systems surrounded by a system and he said that the gap equals the emergence. But the gap also equals the de-emergence from the point of view of being a meta-system. So it is very confusing because the gap represents both emergence and de-emergence depending on how you look at it. Also the word Gap does not substitute well for what I call the meta-system or proto-gestalt that are the duals of the system gestalt. It does not give me a better word to use in my work. It merely shows that the ambiguity of the term meta-system is worse than I originally thought.

After having the original idea that emergence equals the gap and seeing it both in the diagram and the equation form, we went out shopping and continued our conversation as we visited some various stores that Dr. Kasser wanted to go to. We came back and continued our conversation concerning special systems theory until Dr. Kasser had to go in order to be able to catch his flight in the next day. Both of us felt I believe that we had seen something important. But I was especially worried about it because it seemed to question some very fundamental assumptions I had been making, and I was not sure of whether I was going to be able to recover gracefully from that sudden simple realization of the geometry and algebra of emergence. However, I was excited because

I suddenly had a way of expressing what I meant by special systems theory in terms of design which any Engineer could understand readily. So there were pluses and minuses for me. Dr. Kasser said that he had not thought so hard in one day for years. And he considered this discussion we had had to have made the whole journey to the USA worth while, as he was somewhat disappointed in the CSER conference as a whole. So I was pleased that we had such a positive interaction and was also excited when he suggested we did a joint paper on the idea for the ANZSYS conference coming up in Adelaide in November 2004.

Experiencing an Emergent Event

To me this had all the feel of an emergent event and it seemed fateful that I had just been talking about the meta-levels of emergence the day before. It seemed as if this were an example of an insight into the lowest emergent level which is additive and combinatoric change. In other words the gap we were talking about is additive both in a geometrical and algebraic sense. It is just an area between the lines of the system and the sub-systems geometrically, and it is just an added variable to the kinds of equations that Wymore was writing as his definition of emergence two days before, it was a variable that exhibited either emergent excess or lack and we both recognized that it could be seen as an imaginary part of the equation. If that is true then what we have here is just a way of understanding the lowest level of emergence in a geometric and algebraic analogy. Thus it calls for more research how the higher levels of emergence might be represented mathematically.

But what I would like to report on was my own feelings during the conversation. It was as if the rug was being pulled out from under me. I felt intellectual vertigo. I have felt that before when something fundamental changes in my ways of looking at things. But it does not happen often. It was as if I did not know how far this revolution was going to take me and I was worried that everything might collapse despite Dr. Kasser's reassurance to the contrary. I mentioned that this was an unintended consequence of his having the frequent flier miles that allowed him to attend the conference, and that he should be careful how he spent his frequent flier miles in the future, it was not good to go around the world destroying peoples systems theory visions that had taken years to build up in one fell swoop of brilliant insight.

So I don't know the complete results of this realization and its effects on my ways of looking at the problem of emergence. But I am really shocked that I have not seen this in the literature previously, because it is so simple and obvious once you understand the geometrical and algebraic analogy. I guess we just don't think that emergence can be represented in arithmetical and simple geometrical terms so we don't even attempt it. It took my insistence that the gap was the meta-system for Dr. Kasser to then say that the gap was the emergence. He asked why not just say that? And I said that I wanted emergence to mean more than that. But I had to agree that as we looked at the diagram, the gap between subsystems and system boundaries was exactly the excess that made the system more than the sum of its parts. Similarly if we took out the subsystems so there were holes then the gap itself was still an image of the whole less than the sum of its parts because the sum of the parts were now taken out of the whole. We are assuming that the left over gap area is less than the subsystem area that has been taken out. So emergence and de-emergence is represented by the same gap just looked at from a slightly different position in the same diagram.

So really this emergent event of the realization came out of the exchange we had which shifted our way of looking at the concept of emergence related to the system and it's related idea of de-emergence related to the meta-system. It was possible because we had exactly the same idea that a system was a projected schema. But we had different definitions of meta-system. It was discussing my odd from his perspective definition that led to the realization that this difference can be seen geometrically and algebraically in a very simple and straight forward way, which should

be used in every text book that explains the concept to undergraduates. But it also has implications for those who use formulas to represent systems engineering concepts like Wymore and others. There is a strange term, probably an imaginary part that represents the excess (i) or lack (-i) aspects of the system. That part is made up of lower parts that are the distinction between the gap and the surface of the sub-systems. These lower level distinctions can be represented as hyper-complex algebras which are extended imaginary parts. It has to do with the touching, non-touching or overlaps of lines delineating subsystems. This could lead to a chemistry of the combinations of these special systems, but all seen in terms of the segregation of the parts of the system interpreted as functionality and behavior of the system and the relation between the design and the requirements. This possible new language for explaining the relevance of special systems theory to systems engineering design activities is very exciting and addresses the practice aspect of the title of my Dissertation directly. So what seemed to suddenly emerge was the practical application that I had hoped to find for the Special Systems theory within Systems Engineering practice. It that is true then that makes me very happy because I was not sure that I was ever going to find that connection to practicality that I was seeking. So we could call this an example of the emergence of the practical, or perhaps the practical reasoning that makes the special systems theory relevant to working engineers.

Implications

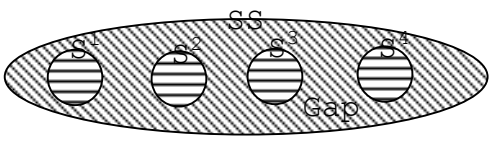
I will start out by assuming that this emergent concept regarding emergence does not destroy everything I have built up over the years with regard to my understanding of emergence, until proved otherwise. If it is a different kind of emergence than any of those identified in my briefing at CSER then it well may meaning starting from a clean sheet of paper. But for now I will assume that when we are talking about the gap being emergence that we are talking about what I call emergence meta-level one which is additive and combinatoric emergence. This gives a way of connecting this new insight into what I already know about emergence. The key point is that when I claimed that the gap between the subsystem surfaces and the system surface was the meta-system in my terms, Dr. Kasser responded that it was the emergence itself, i.e. the emergent excess. Thus we were making opposite claims about the same gap. One of us was claiming that it represented de-emergence and the other that it represented emergence. What was strange was that it seemed to have represented both from different points of view, and this fact that it was at the same time emergent and de-emergent was what triggered a new way of looking at the diagram in our minds. The point was that the meta-system as context was a view from the inside of the system out. Dr. Kasser made this assertion and I accepted it. He said I was always looking from the inside of the system out when I saw the gap as the meta-system as context. But then that raised the question what the view from the outside of the system in which de-contextualizes might be. And that de-contextualization must be the arising of emergence as the excess. From the point of view of the meta-system minus the sub-system there is only the gap, and that gap is de-emergent. But from the point of view of the system arising leaving the context behind then there is only the emergence of the system, qua subsystem in this case. When the gap vanishes then what is left is the system, either as surface of the system seen from the inside or as surface of the subsystem seen from the outside. Either way when the gap vanishes then you seen the emergent excess of the system, so the emergent excess of the system seems to be synonymous with the disappearance of the gap, and you can take the further step that Dr. Kasser took that the gap itself IS Emergence level one.

What this means is that my analysis of the meta-system and its ambiguity as a term has deeper implications than just the mere definitional differences between the various meanings of “meta” as beyond, above or in terms of control. In this case I use *meta* to mean beyond. In the case of logical types I use *meta* to mean above. I tend not to use *meta* to

mean control. Dr. Kasser used *meta* to mean above in the sense of the super-system which is a recursion of the same schema onto itself. This brings to a crunch the need of a term for the meta-system that is intrinsic to that level of schematic emergence. We started calling it just the *gap* but that is not a sufficient term. Dr. Kasser suggested I make up a term. I have tried to avoid doing that because these made up terms tend to be forgotten by the tradition. But now the Meta-system term is beginning to be more trouble than it is worth, even though I like it because it suggests the next level schema up from a system schema without saying what it is. I need to look harder for a generic term provided by our culture. Perhaps the best might be ecosystem, but that suggests only biology and is like the meta-system term just replacing *meta* with *eco*. All other terms are too specific like context, environment, media, situation. Some terms like situation or context suggest something unstructured and others like media suggest something too structured. What the correct term might be is a quandary. Because of the haphazard way terms are used what ever term you use is already overlaid with prior usages and someone will misunderstand you based on his prior selective reading of the tradition. For instance, Dr. Kasser thought meta-systems were super-systems. And I have seen the term used that way before. But I think that is a fading meaning. Anyway more thought needs to go into this terminological difficulty.

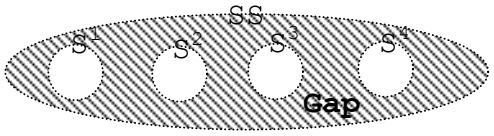
Here I will interpret the gap as being the meta-system or proto-gestalt as I have defined them in earlier papers. But the difficulty comes when Dr. Kasser says that the gap can be seen as the emergence itself, assuming here the additive or combinatoric emergence of emergence meta-level one. When you look at the following diagram in this light:

$$SS = S^1+S^2+S^3+S^4+Gap$$



The SS is the next higher level emergent System while S^n is the next adjacent lower level emergent system. The gap is the difference between the area of S^n and SS. It is clear that the addition of the areas of all S^n and the Gap equals SS. So the whole SS is greater than the sum of the parts S^1 thru S^4 by the size of the gap. The gap is equal to the emergent excess.

$$Gap = -S^1-S^2-S^3-S^4-SS$$



If we take away the surface of SS and the surfaces of S^n. Then we just have the Gap. This is what I have been calling the meta-system. It is the complement of the system inside the system, but the context for the sub-systems outside them. I think that the meta-system exists both inside the System but also outside the system at what ever level. So the Gap is the meta-system and the proto-gestalt in my terminology. But it is also the part that is greater than the sum of the parts that allows you to see the system as a gestalt in Dr. Kasser's way of looking at things. So the meta-system is equal to the emergent excess. This is very strange and is what started my conceptual edifice to begin to sway and feel like it was going to topple. There is a paradoxicality here that is unexpected. The same element is both a sign of the de-emergent as meta-system and the emergent as emergent excess, the so called emergent properties in the same simple diagram. These diagrams can be turned simply into equations by adding a term for the gap and perhaps making it the imaginary part of a complex number.

Now as we begin to accept this ambiguity in exactly a place we do not want it then we can begin to ask questions concerning its meaning. We already know that the emergent excess is precisely what becomes the niche within the de-emergent whole less than the sum of it's parts. So this duality was already somewhat

apparent. Dr. Kasser brings up the difference between a lacunae and a niche as two different sorts of holes which is valid. When we said there was two types of emergent excess he said that was the difference between the excess within the subsystem and the excess that is the gap. So there is actually two sorts of excess and two sorts of lack. But we are here talking about the fact that the gap in the de-emergent whole less than the sum of its parts is equal to the emergent excess of emergence level one. When you create the niches and take away system and sub-system surfaces, then you have the pure context and this context as area is the same as emergence meta-level one excess over and above the subsystems excess. The excess within the subsystems is excluded and the lack is excluded. The lack harms the gap without giving a niche. The sub-system excess is what adds up to give the sum of the parts. They are the two things that would make the gap that is not the excess that completes the system. So in some sense the lacunae and the sub-system excess is the dual of the gap that is the meta-system. In some sense it must be related to de-contextualization. If we see the gap by contextualization then we see the lacunae and the sub-system excess by de-contextualization. There is then a dual of the meta-system that is hidden. What if we call this the infra-system. I have used this term in other contexts to denote probably different concepts. But let us use it here because *infra* is a good dual to *meta*.

So our hypothesis is that there are in relation to the difference between sub-system and system two different fields. One is the infra-system and the other is the meta-system. One, the meta-system contextualizes and the other the infra-system decontextualizes. One, the meta-system looks out from the system to what is beyond it. The other, the infra-system looks to the system from what ever is beyond it. The meta-system is the gap between the sub-system excess and the excess between the subsystem surface outside and the system surface inside. This would suggest that the infra-system is the abundance that exists when you combine the lacunae with the sub-system excess. It is related to the sub-system surface inside and the system surface outside. It seems that these elements should not be combined. What would the system surface outside have to do with the sub-system surface outside? What would the lacunae have to do with the sub-system emergent excess within? In other words the gap is unified and these are dispersed. We are dealing with the underside of the underneath when we postulate de-contextualization as the opposite of contextualization. It is a very strange idea.

However, we have some leverage because we know that the meta-system has four parts, source, area, boundary, and origin. So the area of the gap is that area. The boundary is the system surface. The origin is perhaps related to the sub-system surface. And the source is something beyond the gap from whence the systems that appear in the meta-system appear. The origin could be the proto-niche. The source is the template for the system beyond the meta-system.

Can we turn this around to understand the de-contextualized infra-system? Could it be that the lacuna is related to the origin as the anti-niche. Could it be that the emergent excess in the sub-system is related to the source. Could it be that the inside boundary of the subsystem is related to the boundary and the outside boundary of the system is related to the area. Can we say that areas have become surfaces and surfaces areas in this dual of the meta-system as infra-system? This reminds us of the Birkenstein bound. That bound says that three dimensional spaces can be encoded into surfaces and then read back out of surfaces and it says that one quarter of the surface of separating the spaces is entropic. Perhaps what we have here is something like the transfer function of the Birkenstein bound. In other words we are counting on the system and the sub-system to be surfaces separated by the three dimensional solid of the gap, or lines separated by the area of the gap. Notice this applies to all dimensions and so it plays into the relation between the schemas and the dimensions mentioned in my work on the relations between the dimensions and general

schemas theory. But the gap is unified. Take away the inner surface of the system and the outer surface of the subsystem with the emergent excess it contains and you have the gap that I call the meta-system, that is the context of the sub-system and the inner environment of the system that allows the sub-system to exist and exerts filtering on it. By taking away the sub-system surface and the emergent excess of the subsystem area we concentrate just on the context that is neither the system nor the sub-system but is the context of the sub-system. Now if we consider the possibility of lacunae in the gap, if we consider the outer surface of the system or the inner surface of the subsystem. Also we might add the meta-context of the system beyond the outside of the system. And we would also add the emergent excess within the subsystem. These are all disparate elements that are not connected. These are the antinomy of the gap meta-system which we have provisionally named the infra-system. Notice that the lacunae is disconnected by definition from the outside surfaces and what lies beyond them. They are by definition disconnected. But interestingly they have a structure that is quite similar to the structure of the dualistic opposites in relation to the non-dual. Here the lacunae is like the non-dual that is separated from the duals of what at and beyond the system surface and what is inside and within the subsystem surface. Thus there is an inherent separation here like that we have seen in the non-duals that structure the western worldview mentioned in some of my other papers. So one way to think about the infra-system is that it is the hidden sub-structuring of the field by the relation between the duals and non-duals. The area here is the area of the surfaces of the boundaries. The boundary here is the inside and outside contexts beyond these boundaries. Notice area and boundary are switched in terms of their meaning. The origin would be the lacunae which is a place which might turn into a niche in the future for some new kind of system. We can posit that the lacunae that appears in the system might be based on something that lies outside or inside the boundary of the sub and super contexts which would be the source. In this way we might thing that the sub and super contexts have a source and that when these contexts are traversed then the lacunae appears as an origin for a possible new kind of niche and thus a new kind of system within the meta-system. Thus the infra-system as the opposite of the meta-system would be the way in which the meta-system was transformed under the influence of emergence. In this case all the divergent and different elements of the infra-system have a purpose in their duality to the elements of the meta-system. If the meta-system is the expression of emergence rather than de-emergence, then it is because the infra-system is turning it inside out and transforming it.

The question now is whether this turning inside out is a Birkenstein type phenomena. We see here that boundaries become areas and areas boundaries in the infra-system. The outer and inner contexts become a boundary beyond which is a source. The surfaces of the system outside and the subsystem inside become areas that impinge upon the inside surface of the system and the outside surface of the sub-system. The lacunae within the gap is separated from the edges of the meta-system and becomes the origin that is the opposite of the source. The origin may become a new niche, non-system, or a new system. It is clear that the origin, source, area, and boundary distinctions still hold sway but seemingly in a different and more puzzling way in the complementary infra-system that de-contextualizes rather than contextualizes as the meta-system does. The structure of the relations between the duals and non-duals is hidden in this antinomical substructure of the disparate and separated concepts that encompass the gap as meta-system. It is the transformation from boundary to area and vice versa that makes us think that the infra-system is an example of the Birkenstein phenomena.

The Birkenstein phenomena has to do with black holes and information loss as things fall into black holes. The Birkenstein bound says there is a limit to information loss in this way.

It says that there is a transfer of information to the surface of the black hole and that one quarter of the surface of the black hole is entropy of all the information that has fallen into the black hole. Other theories talk about how information might come back out of the black hole when they evaporate. One of those posit that strings become big inside of black holes and form knots that hold information that falls into the black hole which appears again as the black hole evaporates. What we find interesting with Birkenstein is the idea that information in a space can be encoded into a surface and then read back out again. If we have transformation between surfaces and areas, i.e. between dimensions then perhaps this is related to the coding and decoding process. However, this connection is completely unexpected. The idea that the meta-system has a dual is also unexpected. The idea that this dual hides the structure of the relation between the duals and the non-duals is also extremely unexpected. And all this unexpected information due to the ambiguity between whether the gap expresses emergence or non-emergence. It is a paradoxical gestalt with two overlapping figures like the old woman and the young girl in psychology text books. It is a paradox because the very same element, the gap can be seen as either de-emergent or emergent. If it is de-emergent then it is related to the de-contextualization of the meta-system. But if it is emergent, then perhaps that is because it is related to the contextualization of the infra-system. De-contextualization is the move down into the sub-system surface as an emergent whole. Or it is a move into the level of the emergent surface. It looks from these surfaces inward. And what does it see, the total area within, i.e. gap plus sub-system areas. The system plus context and the sub-system plus area within are opposites. The gap is between them as their complement. The gap erases the inside of the system and the outside of the subsystem to just leave the emergent excess over the subsystem inner boundary plus their area within. The gap also excludes any lacunae. The gap is an area. It has a specific outward boundary. That are the surfaces of the system. It has an origin and a source beyond the boundary. The source is the template outside spacetime of the system. The origin is the point in spacetime where the system arises.

When we talk about surfaces and areas we are talking about two dimensional and three dimensional areas. The surfaces of a system are usually three dimensional spheres, say and the areas are the three dimensional areas between surfaces of the outer sphere and the droplets of the subsystems inside the sphere. If we talk about the boundaries as being two dimensional surfaces, and the areas as three dimensional then we have in place both the incarnations of the form schema. Systems schema can be three dimensional or four dimensional if we add time. Normally a three dimensional system is a set of objects in some configuration of relations, while a form as a single sphere. So from one point of view the forms are like the inner spheres and the system are like the outer sphere. But those inner spheres could contain more sub-sub-systems in which case we could view that form as a sub-system. If time comes into the picture at what ever level then we see the various objects move in relation to each other. But a form can also be two dimensional in which case we have a two dimensional slice of the space or we can have a two dimensional representation on the surface of one of the spheres. Similarly, System can be three dimensional and so it can be seen as a configuration of spheres rather than as a form with a strong outline. We read out the three dimensionality of the system from the multitude of three dimensional forms. We read out the dynamics of the system from the movement of the three dimensional forms in relation to each other. In all these cases we are assuming there is a space between objects and between the system boundary and the objects within. This space is the gap of the meta-system we have been talking about. General Schemas theory points out that this space of the gap actually functions as an operating system and thus constrains the systems within the gap, or constrains the system in its context. But if we de-contextualize rather than contextualize then the infra-system comes into view which is the dual of the meta-system. The

infra-system emphasizes de-contextualization rather than contextualization. It brings the duals and non-duals as a hidden patterning to bear that is the antipode of the patterning of the meta-system.

The Birkenstein bound hypothesis is relevant because it says that there is an inversion between the tree dimensional gap and the two dimensional surface of the system and sub-system shells. Information is read into the surfaces from the contexts as meta-systems and read out in the de-contextualization by the infra-system. The Birkenstein bound hypothesis says just how much entropy is in the surface of the system or the sub-system shells. The entropy is one quarter of the surface area of the shells. Now the question arises how this entropy gets distributed when it is read out into the area between the shells. Surprise is the opposite of entropy. Surprise contains information. Emergence is surprise. So we can think of the gap as emergence if it reads out non-entropic information from the surface and we can think of the gap as de-emergent if it reads out the entropy from the surface. Three quarters of the surface is packed with information rather than entropy that means that the order from nowhere that we see is the reading out of the information rather than the entropy which is predominant. This reading out can be seen as an ordering of the space of the gap. It can be seen as the production of emergent excess of emergent properties. On the other hand if the entropy is read out then what we will see is the creation of a lack or niche rather than emergent excess. Suddenly the dynamism that creates the emergent excess or lack by reading out of the surface into the three dimensional area surrounded by the surface can be seen as important. Encoding and Reading out is a dynamic activity in time so that means we are talking about the four dimensional system when ever this reading out or encoding is being considered. But it behooves us to carefully consider how this might work at each dimensional level of each schema that is composed of two dimensional representations or repetitions each. This will be a subject of future research.

Looking for the Right Word

Now we have two things the meta-system and the infra-system. What we want is one thing that exists at a level of ontological emergence between the system and the domain. We have called it the meta-system. But we now know it is only one face of something also called the infra-system. What is that one think that has two Janus like faces between system and domain that covers the environment, media, context, situation, ecosystem, operating system, and other kinds of surrounds with the phenomenological nature of the proto-gestalt and proto-flow. In fact there is probably a relation of duality between the infra-system and the meta-system similar to that of the proto-gestalt and the proto-flow. Klir uses the idea of *support variables*. Could we use the term **supports**. Could we say there are supports between the system and the domain. Seems to narrow a word. Another possibility is the **scaffold**. It suggests something between the domain and the system. Still it is two narrow a word. It does not suggest the range of meanings that need to be suggested. What is needed is an all out search for a word with the right characteristics. I don't understand why our language does not supply such a word naturally. As I have said it is a possible blindspot of our culture.

So the situation has just become worse and no real progress has been made in terms of expressing what ties together the complementarities of meta-system and infra-system as an emergent level between system and domain expressing contextualization and de-contextualization. However, some progress has been made in explaining why the gap can be seen as de-emergent or emergent. And it is seeing the gap as emergent that has not been noticed before and is thus the emergent realization or surprise in this case. I want to thank Dr. Kasser for bringing this possibility to my attention and forcing me to consider a wider view of the meta-system that includes

the infra-system. Both of these terms he would radically dissent from using. But in terms of my work I think it is a fruitful distinction that he is forcing on me, especially when we look at the implications for understanding better the Birkenstein bound in relation to systems theory. Also this gives me a vocabulary to explain the implications of my theory to practicing engineers which has been a real trouble spot up till this point in my work.

Back to Phenomenology

When in doubt return to the phenomena as Husserl counseled. I have already identified the difference between gestalt and proto-gestalt. Now we have the difference between meta-system and infra-system to contrast to the system. Gestalts are perceptual and the idea of the system, meta-system and infra-system is conceptual. There is also the contrast between the proto-gestalt and the proto-flow that corresponds to the difference between gestalt and flow which are duals. So the difference between meta-system and infra-system might be similar to the difference between proto-gestalt and proto-flow. This means that the next level up from the system schema but prior to the domain schema might be the non-dual between the conceptual and perceptual on the one hand and between gestalt and flow or meta-system and infra-system on the other. In other words we are looking for something which is between these four terms at that level when we are searching for the true name of the schema which I have been calling the meta-system.

A system is a gestalt. Dr. Kasser and I agree on this definition. A gestalt is a figure on a ground representing the tension between them. A system is a set of objects that can each be taken as a figure on the background of all the other objects and their relations. So to see a whole system one must take a series of gestalts. It is the proto-gestalt which is an implicate order that determines the explicit order of the focus on each of these figures in order. In other words the proto-gestalt is the inner coherence of our gazes at the system. These gazes are informed by the glance which takes in the whole scene at once and then it is the propensities to look at different parts of the scene that gives us the various gazes that unfold from the glance. With the glance we see the whole system as an ambiguity. With the glances we do an inventory of the various objects within the system making each a figure on the ground of the rest of the system. The proto-flow is the opposite of this set of successive frames. The flow is the opposite of the gestalt. In the flow we establish a reference point and then watch the flow of the ambiguous whole against this background reference point. A proto-flow is a series of flows and reference points that we glance at in sequence within the ambiance of the gaze at the whole river that contains many flows. Proto-gestalt takes in a series of figures on backgrounds of the whole system. Proto-flows takes in a bundle of smaller flows on the background of many reference points and a whole river of flows.

The proto-gestalt and the proto-flow establishes the horizon within which figures and streams are seen by the glancing gaze. The generation of horizons is the fundamental feature of the meta-system level. It is the horizons of one perspective. When we go up to the domain level there are multiple perspectives working together to establish a rigorous discipline. So horizon generation is the key property of the meta-system level. For the meta-system this horizon generation is conceptual rather than perceptual. What we are learning is that the conceptual horizon generation really has two complementary aspects we have called meta-system and infra-system. The first establishes the environment, context, situation outside the system. The Second establishes the sub-structure of non-duality between the disparate elements. The meta-system is a filtering on the system level, it establishes the resources for the systems and the niches within which systems can thrive. The infra-system is a new idea. It establishes the relation between the disparate dual elements that define the meta-system as gap

and it does so on the basis of the relation between the duals and non-duality. The infra-system has to do with the transformation of the two dimensional surfaces of the system and sub-system into the three dimensional space between them. It has to do with the Birkenstein bound and the encoding and decoding of contextualization and de-contextualization.

Let us consider the horizon. As we move we take our horizons around with us. All gestalts must be seen within the horizon that is currently visible. The implicate order within a horizon determines the explicit order of the sequencing of the gaze to look at figures apprehended by the glance. The horizon is related to the glance as the gestalt is related to the gaze. We glance taking in the horizon and all within it and then we have propensities to look at different figures on backgrounds. A sequence of these gazes can constitute a system that we present to ourselves as a coherence of phenomena. When we move around the world we establish different horizons and different points of view, and this gives us the domain. So the meta-system does not yet take into account the movement within the world, but rather only the movement of our heads as we look around within a particular place in the world. As we look around we take in different gestalts which are given coherence by the proto-gestalt.

Word Coinage

Once we have determined that the word we are looking for is one where we are looking around at the same spot so the horizon does not move then we can begin looking for a word with those features and the word that shows up after some desperate searching is the word "**Scape**." Scape is the stem of a leafless flower like a tulip. A scape is also a pillar or column. So a scape is something rooted to one spot. But a scape also means what surrounds that spot, the view, vista, panorama, outlook, perspective, and prospect from that spot. Scape in poetry also as a verb means to "Escape", which means to move out from a spot toward the horizon. Unfortunately we are used to seeing the word scape as a suffix to other words like landscape, seascape, mindscape, netscape, so it is unusual to use the word as a noun on its own as we might do to describe the meta/infra-system, as the next schema up from the system and the next schema down from the domain. However, at the moment it is the only word that I can find that fits the bill, and so we will try to make use of it until some better word comes along. Fortunately it is not a new word, it has a long history in our tradition, it is just that it is not usually seen as a stand alone word. Another meaning that is related is a 'scapement' or 'escapement' which is a gear related to a rocking leaver which is used to tell time. This word is especially apropos because it is at the level of the meta-system that the four-dimension usually thought of as time enters the scene. It is a grid of clocks that are used to define special relativity.

Once we have considered using the term scape as the non-dual between the meta-system and infra-system on the one hand and the proto-gestalt and the proto-flow on the other then we can consider using compound words with the word suffix scape to describe these other compelementarities. For instance, we can use the term set-scape or landscape to describe the proto-gestalt. We can use the term mass-scape or seascape to describe the proto-flow. Also we can use the terms gap-scape, niche-scape, or eco-scape to describe the meta-system. And we can use the terms environoscape and surround-scape to describe the infra-system.

Notice that the terms meta-system or infra-system or proto-gestalt or proto-flow look up from the system level and attempt to approach the next higher level of ontological emergence of the schemas. With the word scape we are also dealing with conjuncted words, which seems apropos of the form X-scape, where the word scape is a multiform delimited by some prefix. If you look up the word scape on the internet with a search engine it is possible to see all the various words that are used as prefixes and how seldom scape is used alone. However, there are some instances where

scape is used alone and it will be those instances that we will follow when we use the term scape to designate the meta-system schema.

The key difference between the scape and the system is that the scape is the surrounds of the system. But it is the surrounds of the system at what ever level of repetition or iteration or recursion we desire. So it is thus the gap between sub-system and system and between system and super-system. Between each level of the system repetition, iteration or recursion there is a scape, which is an escape from the system to what lies beyond it. However, we also recognize that the dual of this gap is the infra-system which is another manifestation of the scape. We will consider the scape as the non-dual between the meta-system and the infra-system. The scape in this manifestation carries the non-duals and duals relation to each other as a hidden structural element. The scape is the proto-gestalt which organizes the glance into gazes at various gestalts from a specific point in the environment. This is its set like manifestation. It also has a mass-like manifestation as the proto-flow which sees the staff as a reference point against which the river of change is measured. The proto-flow reverses the relation between staff as position of viewing to the reference point for viewing.

I have been searching for a long time for a word that can be used to describe the meta-system. I never found one until Dr. Kasser Kasser forced the issue by making me recognize that there is a difference between meta-system and infra-system, or between the gap-scape and the surround-scape. This forced me to do a very thorough phenomenological analysis which caused me to see the difference between the domain is the difference between standing in one spot and looking around, and moving in the environment to gain different perspectives under different horizons. In the scape there is one static horizon against which all gestalts are formed. The scape is what is surrounded by the horizon that shows up as a landscape, seascape or some other form of scape. We escape toward that horizon if we are in danger and we are forced to flee. Within that horizon there is a temporal aspect that shows up in the relativity of clocks defined by escapements. Once the phenomenological analysis was done then the question was what do we see if we just turn our heads and bodies without moving. The answer was a landscape. So I started wondering what the scape part of that word meant that is seen both in the set-like landscape and the mass-like seascape. It turns out that that word has some attributes that are necessary to describe the view, vista, panorama, outlook, perspective and prospect that appears from one position in a landscape to which we are rooted as a flower stem or a pillar. For the scape the horizon is fixed in relation to a specific spot in the landscape from which the rest of the landscape is viewed as a panorama. We could refer to the scape as an X-scape to denote that it almost always appears conjuncted with some defining term. This conjunction seems only right since the meta-system is made up of conjunctions, in terms of metonymy and juxtapositions of things that happen to inhabit this patch of spacetime or timespace. Thinking of ecoscapes as patchworks and niches is a relatively new way to view environments. What the term scape lacks is the precise idea of complementarity with the system. System/Scape complementarity is a key concept that is related to the term meta-system. We do not think of the application/operating system distinction or the turing machine/ universal turing machine difference as being like the difference between the system and scape. We do not think of the scape as being organized with its own kind of organization different from that of the system that exerts a filtering influence on the system. So the term scape is not perfect. However, it will do in terms of getting across the basic idea without using a technical term as I have been doing. All the other schema designations are not technical and not fraught with the ambiguity of the term *meta*. So for now we will settle on this use of the term scape to mean the emergent ontological level of the scemas between the system and the domain which up till now has been designated by the term meta-system.

From now on we will use it as a term that is the non-dual between the proto-gestalt and proto-flow on the one hand and the meta-system and infra-system on the other.