Letters to the Editor

We invite readers of the *Journal of Space Philosophy* to send us letters referencing any past publication, to suggest subjects for future publication, or to submit information from anywhere in the Global Space community. ***Bob Krone and Gordon Arthur*.**

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From Barry Elsey, August 4, 2019

Dear Bob and KSI members,

It is gratifying to find that the JSP Summer edition will publish the formative thoughts of Amina and I in faraway Australia. We both regard our effort as a first instalment in what should become a long voyage of discovery about the depths of thinking required to make more sense of Space education. It is one thing to be inspired by the bold vision of KSI and another to take account of the many realities on the way to making Space education an imperative. We all need understanding of why and how human behaviour through learning and knowledge formation needs to be developed.

Let the new learning venture continue!

Barry

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Reply from Bob Krone, August 4, 2019

Dear Barry Elsey,

Thank you so much for these comments. I'm reflecting on your and my association as we shared doctoral supervision in Asia beginning in 1995. We took a concept that had developed in the world of doctoral education, and we called it the Elsey-Krone Model, which got expanded use, and which you and I have continued to find valid for doctoral candidates. The model had three components: (1) do in-depth research to find out what knowledge there is in the world on your selected subject, (2) identify what you feel is needed to expand that knowledge and which is missing, and (3) create your unique identification and prescription for how to achieve that new needed knowledge, and professionally write it into a dissertation that examiners will approve and endorse.

Candidates that you and I have supervised have used that model successfully for close to half a century. Now we are ready to take that model into KSI's academics on a much broader scale and with a much more ambitious vision. That vision comes under the Law of Space Abundance, which we formulated in 2009, which states that Space contains an abundance of resources to meet human needs. That is a law of the nature of the universe

beyond Earth, not legislated by any authority. How we capture those resources for humanity on Earth and as humans settle in Space will be the focus of our scholars who have ideas for improving Space exploration, Space development, and human societies.

At this point in human history, we cannot fully identify what those improvements will be; but we can identify the barriers that have prevented achieving them, and we can work on both removing the barriers and creating the science, technology, and policy making wisdom needed to capture that abundance.

We look forward to your, and Dr. Amina Omarova's design of our educational concepts and tools for those challenges.

The KSI Team

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Some Comments on Recursive Distinctioning and Recursive Patterning

From Joel Isaacson, Louis H. Kauffman, and Bernd Schmeikal, August 27, 2019

I. Recursive Distinctioning.

Recursive Distinctioning (RD),[1] means just what it says. A pattern of distinctions is given in a space based on a graphical structure (such as a line of print or a planar lattice or given graph). Each node of the graph is occupied by a letter from some arbitrary alphabet. A specialized alphabet is given that can indicate distinctions about neighbors of a given node. The neighbors of a node are all nodes that are connected to the given node by edges in the graph. The letters in the specialized alphabet (call it SA) are used to describe the states of the letters in the given graph, and at each stage in the recursion, letters in SA are written at all nodes in the graph, describing its previous state. The recursive structure that results from the iteration of descriptions is called RD. Here is an example. We use a line graph and represent it just as a finite row of letters. The SA = {=, [,], O} where "=" means that the letters to the left and to the right are equal to the letter in the middle. Thus, if we had AAA in the line, then the middle A would be replaced by =. The symbol "[" means that the letter to the LEFT is different. Thus, in ABB the middle letter would be replaced by [. The symbol "]" means that the letter to the right is different. And finally, the symbol "O" means that the letters both to the left and to the right are different. SA is a tiny language of elementary letter distinctions. Here is an example of this RD in operation, where we use the proverbial three dots to indicate a long string of letters in the same pattern.

[1] Joel D. Isaacson, "Autonomic String-Manipulation System," US Patent 4,286,330, August 25, 1981, www.isss.org/2001meet/2001paper/4286330.pdf; Joel Isaacson and Louis H. Kauffman, "Recursive Distinctioning," *Journal of Space Philosophy* 5, no. 1 (Spring 2016): 9-64.

... AAAAAAAAAABAAAAAAAAA ...
is replaced by ... =========]O[========= ...
is replaced by ... ========]OOO[======== ...
is replaced by ... =======]O[=]O[======= ... .

Note that the element]O[appears, and it has replicated itself in a kind of mitosis. In our previous articles, we have pointed out relationships between this form of self-replication

It is a key problem to consider RD in this standard form where the basic alphabet is produced by the recursive process itself. We are in the process of examining patterns of RD in one and two dimensions in this framework.

II. Recursive Patterning

It is also worthwhile to consider recursive patterning (RP) that is based on local distinctions, but not necessarily in this orthodox form. In this case, we look for significant RP that satisfies this more relaxed criterion. Here is an example. Consider strings of symbols with the alphabet {*, <, >} and recursive reduction rules

1. ** → <*>
2. > < →

Rule 2. means the two consecutive opposing brackets can be erased from the string.

Example a:

***** →
<*>*** →
<*><*>* →
<**>* →
<<*>>*

Example b:

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<*><*><*><*><*><*><*><*><*><*><*><*><*><*><*><*><*><*>*
<**********>*
<<*><*><*><*><*><*><*><*>*>*
<<*******>*>*
<<<*><*><*><*>*>*>*
<<<***>*>*>*
<<<<*>*>*>*>*

We also give a code for describing binary numbers using this alphabet.

Take a binary number such as 1101.

Rewrite it in the form <<<1>1>0>1 by first placing a right bracket > between each pair of digits as in 1>1>0>1, and then placing as many left brackets on the left, as in

<<<1>1>0>1. Call this the *bracketed binary number*. Now, in the bracketed binary number*, replace each 1 by a * and replace each 0 by a blan*k. Thus <<<1>1>0>1 is replaced by <<<*>*>>*. This *binary star form* of the binary number is now expressed in out string alphabet.

Theorem. If the RP described above is started with a row of N stars, then the final line of the recursion is a conversion of N into its unique binary star form.

The proof of this result can be found in Louis Kauffman's 1995 article, "Arithmetic in the Form."[2] For example, examine Examples a and b above. In Example a, we start with ***** (*N* = 5), and we arrive at <<*>>*, which is the binary star form of 101, and 101 is the binary form of 5. In Example b, we have *N* = 31 stars, and the process results in <<<<*>*>*>*>*, which is the binary star form of 11111, the binary form of 31.

This binary reductive RP depends for its operation on very simple local distinctions and operations upon them. It is, however, not directly descriptive of its previous rows. The simplicity of its rules allows further work, so that it can model ordinary arithmetic, and with other choices, it can work in other bases than Base 2. We see from this RP example and the basic RD structure that powerful computing methods are possible by using only recursive distinguishing and very little mathematical structure at the basic level. Significant mathematical structures, such as arithmetic, can then arise from the patterns of recursive distinguishing.

The purpose of this short letter has been to give an introduction to part of our present thinking about RD and its patterned relatives.

III. Commentary by Bernd Schmeikal

My gosh!

The electronic spacetime is crowded with uncountable lists of automata. Joel discovered RD (and later its relationship Wolfram 126) in the 1970s, which, indeed, was an excellent move. But Wolfram lived and worked later between Feynman and Gell-Mann, and the latter had introduced strangeness and all the rest of it. That requires Wolfram 16. Why? Because quarks and hadrons cannot be made by just left and right neighbours, OK? Kauffman avoided crashes like those, by concentrating on distinctions and turning the whole Fermion representation into iterant views. Why I am appreciating this? Because neighbourhoods in a real world are nonlocal, and they are nonlocally processed! And time is not iterant time! Therefore, until now, all the Wolfram circus has just been knitting patterns without any real life! Read Wolfram's attitude towards Feynman and Murray, and you will know what I mean. Are we sleeping or what? You cannot overrun the social pattern by force! Science remains false if we just explode our thoughts all the time. Thoughts must be tender, charming, and correct, open to that which is not a thing." What do I propose to think about? Where RD in Physics is concerned? Call it "Recursive

[2] Louis H Kauffman, "Arithmetic in the Form," *Cybernetics and Systems* 26 (1995): 1-57.

Distinctioning in Strange Force Phenomena." Let me mind "Differentiation of Different Fields" and the triple *Physics – Artificial Physics – Mathematics*

Differentiation calls for integration. This is a matter of speaking. It is, perhaps, within some sort of objectifying science, even a fact of language. The ones who invented such fine tools as RD are the ones who at the same time are calling on the scene a series of possible mix ups. Therefore, I expanded the concept of RD with Antecursive Conflation (AC).[3] So it may become possible to avoid indefinable nebulous confusion on the transdisciplinary set.

The meaning of concepts having the same name varies from subject to subject. Consider the meaning of the word "cell." Explaining "the method of the most probable distribution" in *Statistical Thermodynamics*,[4] Erwin Schrödinger describes the classical scheme in which "states will have to be described as cells in phase space". Most physicists are familiar with such use of the word. But *cells in cellular automata* are something else. And in the intellector, a topological neighbor is not the same as the neighbor of a parton in a proton. These differences have to be investigated before constructing applications!

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Editors' Notes: We want to state to readers that this is an important communication from three of the world's most knowledgeable scientists on the discovery and research into the natural phenomenon of RD. There have been *Journal of Space Philosophy* publications on RD since 2012, including the Special Science Issue published in Spring 2016, which gave references extending back to the 1981 patent awarded to Dr. Joel Isaacson. These publications have documented RD as fundamental to human cognition, neurological and biological systems, mathematics, and computer sciences. KSI has sponsored four annual conferences on RD, commencing in 2014. Reports of those conferences have been published in several issues of the *Journal of Space Philosophy*. This letter to the editor points out continuing RD research. ***Bob Krone and Gordon Arthur.***

[3] Bernd Schmeikal, "Four Forms Make a Universe," *Advances in Applied Clifford Algebras* 26, no. 3 (2016): 889-911.
[4] Erwin Schrödinger, *Statistical Thermodynamics* (London: Cambridge University Press, 1946).