SELF ORGANIZATION AND SELF GOVERNANCE:

EXPLORING THE INTERFACE OF CYBERNETICS AND PUBLIC CHOICE THEORIES

Based on "Self-Governance: A Key Theme at the Interface of Cybernetics and Public Choice Theories", Working Paper by Paul Dragos Aligica (George Mason University) and Paul Lewis (King' College London).

The paper starts by advancing a reconstruction of the intellectual sources behind the Ostroms' perspective on self-governance and, in doing that, it will reveal a novel and perhaps surprising ingredient in the mix of intellectual influences inspiring the foundations of the Bloomington research program: cybernetic theory, seen as a theory of control via feedback mechanisms. Based on these crucial insights, the next sections engages the problem of self-organization as an architecture of multiple levels of so-called 'second order' social feedback mechanisms. Such compounded systems of organization are the key to understanding any self-governance process and their intrinsic logic provides a critical link to the public choice and constitutional political economy perspective on institutional order, a perspective which converges naturally with (and works as an extension of) those basic insights. The result will be a more nuanced understanding of how complex phenomena such as self-governance are to be defined and a fresh view not only of how one could conceptualize the Ostromian view of self-governance at the interface of cybernetics and public choice theories, but also of governance theory in general.

(…)

4. SELF ORGANIZATION AND SELF GOVERNANCE

…Let us take as a starting point in our discussion the work of W. Ross Ashby, a pioneer in the field of cybernetics. Ashby's influence on the Ostroms' views has been constantly acknowledged both by the Ostroms and by those familiar with the history and evolution of the Bloomington research program (V. Ostrom [1971] 2008: 115, 252 n. 2, [1988] 1999: 182-83, 1997: 121, 125, 184-85, 222-23). As Michael McGinnis and Elinor Ostrom observed, Vincent Ostrom

> was among the first scholars to participate as a fellow at the Center for Advanced Study in the Behavioral Sciences at Stanford University (1955-56). There, he enjoyed many in-depth conversations with W. Ross Ashby, whose emphasis on requisite variety convinced Ostrom that governance systems need to be at least as complex as the physical and economic systems they are meant to govern. This concept fit nicely with Ostrom's growing appreciation of the need for policy

> experimentation and diverse ways of articulating and aggregating citizen preferences for policy outcomes (McGinnis and E. Ostrom 2012: 16).

Once aware of this influence on his views, it becomes easier to identify a deeper layer in the structure of Vincent Ostrom's thought, a layer which preexists his work with Tiebout and Warren and the launching of the Public Choice Society. In the light of this insight one can understand many of the enduring underlying themes in his work as the outcome of an initial impetus to build on the message of cybernetics, as it was understood in the 1950s (i.e, as *control theory*, a theory of systems design and control). A *cybernetic system* is one that produces an action in response to an input of information and which includes the results of its own action in the new information by which it modifies its subsequent behaviour. The classic example is a central heating system, which responds to the current temperature of the relevant house in the information that governs whether the heating will be switched on or off.

It is worth recalling that the notion of "cybernetics" was constructed by Norbert Wiener (1948: 19) from the Greek word for the art of steering, "kybernetes". Wiener defined it as the "new science" of "control and communication" (1948: 22, 19). In Latin that translates to the equivalent of 'governance' and 'governing', and the execution of the functions of the 'governor'.[1] So, one may see even at the level of the basic terminology and vocabulary the straightforward connection between the theories of *control* and the theories of *governance* and *social organization*. Vincent Ostrom was among the first social scientists of his generation trying to explore the implications of these ideas for the domains of the administrative and political sciences. Yet, as noted above, so far despite the stark evidence, and the repeated references to the contributions of Herbert Simon and the research line focused on the "artifactual", the implications of that influence when it comes to the core Ostromian theme of governance systems and processes has been overlooked. But the issue is crucial for our attempt to get a more nuanced understanding and development of the Ostroms' notion of self-governance. And in this respect Ashby's work offers an excellent vehicle.

In discussing self-organization (and, by implication, self-governance which is a subclass of the larger theme) Ashby (1962: 266-67) noted that self-organizing is open to quite different meanings, and he wanted to make sure that the focus is strictly on those meanings (and phenomena) which matter. He dismissed the notion of self-organizing in the sense of a process of "changes from 'parts separated' to 'parts joined'" (1962: 266). That is to say, of a process which starts with parts separate (so that the behavior of each is independent of the others) and whose parts then act so they move towards forming connections of some type. That is not, explains Ashby, the interesting 'self-organization'. Such systems can be more simply characterized as "self-*connecting*" (1962: 267). As a parenthesis, let us note that one could easily see that if we follow Ashby's logic, a lot of what counts today -in one theoretical and empirical form or another- as contributions to governance theory, are not quite that, as they focus merely on the connectivity and correlation side of things.

[1] Indeed, one of the founding works of cybernetics was Scottish physicist James Clerk Maxwell's study of the working of speed governors in steam-engines, entitled 'On Governors' (Maxwell 1968).

The truly interesting systems, Ashby argued, are those that are able to bring about changes from unorganized to functionally organized, from a 'bad' dysfunctional configuration to a 'good' one (1962: 262-63, 265-67). This is the second meaning which refers to a change in the direction of good, functional systemic behavior. Ashby's crucial point was to show that not any connection, linkage or correlation matters. The process is not just about connectivity but also about a form of improvement based on one functional criterion or another. More specifically, there is a subclass of causal and informational connections which is decisive. Self-organization may be seen in this respect as a function of a feedback process adjusting in a homeostatic manner (Ashby 1962: 266-67; also see Dupuy 2009: 148-49).

A homeostatic system is one that is capable of adapting itself to its external environment in the following sense: it will automatically alter its structure and operations so as to neutralize the effect of changes in its external environment and maintain constant the values of certain internal target variables (Ashby 1962: 263). A classic example is provided by the human body, whose metabolic systems operate so as to maintain the value of certain key variables—such as body temperature and blood sugar—within the range required to sustain life (Cannon 1932). Central to the operation of such systems are feedback loops. A *feedback loop* is a circular arrangement of causally connected elements in which an initial cause (the 'input') propagates around the elements in the loop, with each element affecting the next, until the final element (the 'output') causally influences (or 'feeds back' the effect) to the first element in the cycle. For example, a rise in external temperature will cause changes in the operation various physiological mechanisms inside the human body, which cause it to produce more sweat, thereby cooling the body and enabling it to maintain a target internal body temperature. The existence of such feedback loops means that homeostatic systems are capable of modifying their own behavior so as to achieve a particular target output or goal. Such systems are therefore, in that sense, 'purposeful.'

Feedback can thus be seen to be a central element in a mechanism of control. At an even deeper level, the underlying logic is driven by the notion of circularity and, more precisely, of causal circularity: A causes B, and B causes C, while C causes A. Structures of this type defy external manipulation. As such, they seem to capture the core logic of what self-governance may mean at a basic, intuitive level. The first generation of cybernetics thinkers identified what they called 'the homeostatic mechanism' as paradigmatic for the control and organization of a variety natural and artifactual systems. It is clear by now that for the purposes of our discussion, the entire problem of conceptualizing self-governance hinges on our understanding of this 'mechanism'. We have now identified the core logic of an entire class of phenomena, a logic operating in physical, biological and social settings. Three elements are notable in this emerging model: (a) circular causality,

(b) a tendency towards stability and (c) information/communication flows as an underlying linkage of the first two.

Circular causality evokes the image of a steersman who acts on the observed consequences of his actions, or a speaker who continuously adjust and modifies the communication stream while monitoring the reactions of the audience to said stream. This notion of circularity is strongly associated with the idea of a certain form of teleology intrinsic to these systems, a certain final state of stability which is maintained despite the challenges coming from the dynamics of the environment. This type of stability -or tendency towards an equilibrium- is the second salient feature. Self-organization is thus, in a sense, just another way of describing a property emerging from the circularity of that causal mechanism: A potentially strong influence from external sources is in large measure put under control and circumvented. The locus of control is inside, within the boundaries of the "self", not outside.

In all of the above, the notion of stability has to be seen in a dynamic manner. Circular causality could lead both to stabilization but also – in the case of so-called *positive* feedback - to escalation or runaway processes in which the feedback is feeding on itself a process that my escape control in a dysfunctional, "bad" direction. Therefore, there is an additional aspect that has to be introduced into the picture to complete the equilibrating and stabilization component: A certain form of meta-level control given by safeguard mechanism working to monitor and control the first level circularity and being able to stabilize it, if necessary. With that, we fully bring to the floor the third key element: the one related to communication. Control is achieved via communication/information flows which are able to connect all the parts and levels pertaining to the system. The levels of control in circular causality structures are united by an ongoing communication and information flow become the core process of interest.

The evolution of thinking about social order and governance set into motion by the initial cybernetics ideas has bifurcated since the late 1950s around these two pillars: a direction leading to information theory and the other to control theory (Rid, 2016). But in our reconstruction, we do not need more than these initial insights in order to illuminate the origins of the approach to self-governance from the self-organization theory perspective. These observations reveal that both from an intellectual history standpoint and -even more importantly- for conceptualization reasons, these basic 'cybernetic' insights are crucial for understanding the Ostromian perspective on self-governance. It is only in their light that we could get a deeper and fresher insight into the Ostroms' preoccupation with the problem of the levels and meta-levels of institutional structures, and we understand why the dynamic interrelationships between what they have called the 'operational', 'public choice' and 'constitutional' levels of governance are crucial for their theoretical perspective. These levels of governance map out the logical structure of the processes of circular causality based on feedback mechanisms. The constitution of a self-governing society has to encapsulate and reflect the operations of those mechanisms and their underlying compounded logics.

Therefore, revisiting the cybernetics roots of the Ostroms' ideas, and retracing the logic of self-organization, as articulated by the pioneers of cybernetics, we have come to the

conclusion that the key to conceptualizing self-governance lies in the structures of the complex arrangements of second, third and nth-order institutional meta-levels and the reflexivity properties they engender, as converted into overlapping circular processes created in concatenated feedback systems, at multiple levels.

5. THE ASHBY CHALLENGE AND THE ARCHITECTURE OF SECOND ORDER GOVERNANCE MECANISMS

While developing his foundational contribution to the field of cybernetics, W. Ross Ashby identified and raised the fundamental challenge to the very possibility of conceptualizing self-organization and self-governance via first order theories of feedback and servo-mechanisms. Ashby's point was unambiguous: the servo-mechanism in itself, as a basic unit of governance, is a necessary but far from sufficient solution to the problem of self-governance. It is only in the second order theories that such a solution be identified.

To make his point, Ashby (1962: 267) invites the reader to imagine an automatic pilot and a plane. The automatic pilot may be set up to operate on negative feedback (whereby it feeds back as an input to the system a part of a system's output so as to reverse the direction of change of the output) or on positive feedback (such that it feeds back to the input a part of a system's output so as to amplify the direction of change of the output). Suppose the autopilot gets coupled by mistake on positive feedback. This will generate an error aggravating loop, rather than an error correcting one. In other words, the positive feedback is working in a direction which is "bad", dysfunctional for the system.

The system would be self-organizing, explains Ashby, if in such a circumstance, a change would be made in the feedback loop endogenously, shifting the feedback from positive to negative. In other words, a fundamental correction would be made in the very structure of the core mechanisms, in order to change the course from aggravating to mitigating (1962: 267).

But Ashby (1962: 267) points out that no machine can be self-organizing in this sense. And he goes on in articulating in formal -logical and mathematical- detail the nature of the problem. The intuition behind it is clear: The operating setup of the initial feedback mechanism is fundamentally insufficient to solve the problem of switching from positive to negative feedback. We need, he explained, an additional variable, or mechanism, which he identifies as "alpha". Alpha must come from outside the system, S, acting on the system as an input and making from that exogenous meta-level the necessary correction in the first order mechanism (Ashby 1962: 267-69; also see Dupuy 2009: 151).

In other words, it is an additional mechanism which controls from the meta-level the first level system and in whose operational capacity is the capability of switching the feedback from positive to negative. If the system is to be in some sense self-organizing, wrote Ashby, "the 'self' must be enlarged to include this variable 'alpha'" (1962: 269). Ashby showed that, by definition, the cause of change must be in the compounded system consisting of both: System S plus alpha, the level and the metalevel. Moreover, the two need to satisfy certain minimal boundary conditions, in order to qualify as "self". As he succinctly put it: "the appearance of being 'self-organizing' can be given only by the

machine S being coupled to another machine (of one part)". Then "the part can be self-organizing within the whole S + α". It is thus "only in this partial and strictly qualified sense can we understand that the system is '*self*-organizing' without being self-contradictory" (Ashby 1962: 269)

The implications are straightforward and significant: The new compounded system (S + α) is bound to have, again, the same type of problem as the initial, 'first level system', S. Again, let us presume that the self-governance problem is basically captured and reduced to the simple circularity of the feedback regulation as a mechanism of control. One could easily see that the new system has the same difficulty when it comes to switching from one mode to another, outside of its intrinsic automatic feedback logic. A new meta-level is needed in order to generate these kinds of corrections. And again, let us note and emphasize that the correction is a very simple nature in accordance to a very simple binary, positive/negative feedback mechanism. In brief: A new meta- meta-level structure is needed, in order to be again possible to claim that the system has self-governance as one of its properties. In other words, self-governance requires a compounded system of feedback mechanisms, operating on top of each other.

Let us take a closer look at this type of systems….

(….)