Is there anything to fear from the politics of complexity?

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Professor Geyer started his presentation by introducing himself and explaining how he got involved with complexity theory. With a background in international political economy and European Union social and economic policy, he felt he reached a 'tipping point' with the question: "Can one go beyond the theory of 'multi-level governance' to explain the functioning of the EU and its policy outputs?"

One day a friend of mine said: "You know, what you are dealing with is a complex adaptive system" and my immediate reaction was: "what is that and why should see it this way". But he was a phenomenally pestering guy and he went on and on. Over a couple of years, I came more into it and became some kind of a convert. I've written some things using complexity thinking to look at the Third Way, EU social policy, interaction between EU and UK social policy and, now, public policy (particularly health policy and chronic disease -diabetes).

A few years back I set up Centre for Complexity Research and the Complexity Network at the University of Liverpool, which is more a virtual centre than a real one but this network is pretty lively and wonderful. We hosted a major conference in 2005 and what was wonderful about it is that we had 400 participants, which is not huge, but we had them from 18 different disciplines ranging from art, engineering, maths, we didn't have physics but we had electrical engineering, politics, sociology etc. That was the interesting and exciting bit, so if you are interested I can talk about that stuff after my presentation. I am currently trying to make it a joint Lancaster – Liverpool initiative. Anyway, this is my background!

So, where do I see complexity coming from? I want to just walk through it so that you can see how I am seeing things. To me what, I guess you have to jump at what I would call the "paradigm of order". There are lots and lots of thinkers and scientists supporting this paradigm but to keep it nice and simple I sort of linked it with Rene Descartes (1596-1650) and the concept of "rationalism" where human beings can see the world in a rational way and Sir Isaac Newton (1642-1727) saying that fundamentally there are core, unchangeable laws to the Universe and once we know these laws, when we can combine them with our ability to understand the world, we can understand just about anything, we can see "the hand of God", we can really trace the pathways of God in our Universe. There is lot of history here but a lovely quote from French philosopher and scientist Pierre Simon de Laplace (1749-1827) shows that the key implication of all these is that "if at one time, we know the positions and motion of all the particles in the universe, then we could calculate their

behaviour at any other time, in the past or future" (Celestial Mechanics). Just looking at the motion of a planet we can predict its behaviour over time. There are all sorts of problems with this, called the "three body problem" but fundamentally the implication was that if we can know these rules, we can know the past and we can know the future.

The "paradigm of order" throughout history, I would argue, is the dominant framework particularly in physical and natural sciences. We have wonderful quotes such as American Nobel laureate's, Albert Michelson (1852-1931) who complained that: "The future truths of Physical Science are to be looked for in the sixth place of decimals" and One of the implications of "if you know the rules, you can know the future and you can know the past" is that fundamentally there is a limit to knowledge. In other words, the Universe is a giant mechanical clock, Newton and others had already figured out the main gears of the clock, all that was left was little tiny gears to be discovered. In other words, Michelson was saying: "There is nothing big left for us to find, just little bits and pieces" and linked to this is also the sense that there is a hierarchy of knowledge because obviously the fundamental laws are the key then other bits of knowledge are "leftovers", hence the quote by Nobel laureate's Ernst Rutherford (1871-1931): "All science is either physics or stamp collecting". He is not talking about the social sciences, he is talking about biology where you just go out and collect bugs and put them in tubes and boxes – for him you are either in physics or you are collecting bugs!

Fundamentally in this vision of the "paradigm of order" you had elements of disorder or the "Unknown" (not fully understood phenomena) in one side and over time, given human effort, they could be driven over, if you will, to the "orderly box" in the other side of a continuum, where gravity, our knowledge of motion in a vacuum was. So, what it was, human effort in terms of knowledge was just about applying effort that over time would fill in all the blanks, would find those last bits and pieces.

There were four simple rules to all of these, which were:

- *Causality*: given causes lead to known effects at all times and places.
- *Reductionism*: the behaviour of a system could be understood, clockwork fashion, by observing the behaviour of its parts. There are no hidden surprises; the whole is the sum of the parts, no more and no less.
- *Predictability*: once global behaviour is defined, the future course of events could be predicted by application of the appropriate inputs to the model.
- *Determinism*: processes flow along orderly and predictable paths that have clear beginnings and rational ends.

Problems started occurring in the 20th century, at least in terms of maths and physics, with several scientists spreading ripples of doubt over this paradigm. Henri Poincaré (1854-1912) with his early chaos theory, who is basically saying that the world of mathematics is a very "orderly" one but there are all sorts of non-linear, chaotic elements in maths (Poincaré was one of the earliest to explore these). I have put Albert Einstein (1879-1955) with his relativity theory in this list; I don't think that Einstein –if he were alive- would call himself a "complexity person" but fundamentally what he did was shift the rules with which we interpreted the Universe. And to complete this list, Werner Heisenberg (1901-1976) with his uncertainty principle; I am not a physicist but he basically is looking at sub-atomic level analysis: very easy for us at our level to know "I throw a ball and I know its position and velocity, which can be calculated very simply". At sub-atomic level though, you can know position OR velocity; you can't know both. It's just a demonstration that the rules don't fit when we associate different levels.

So, looking at the 20th century and these –sort of- challenges, all of a sudden you get your "orderly" bits but some of your bits are not fitting all into an "orderly" package, leaving not only a zone of "unknown" but a zone of discovery. So, time is not going to push everything into the "orderly" box (in the right side of the continuum); it pushes some things into the "disorderly" box (on the left side of the continuum).

Example of this -in a non-living, abiotic physical world- is the one of fluid dynamics: simple turbulence creates unpredictable outcomes. My favourite example is the study of sand piles: take a simple disc, dribble sand all the way –obviously very important in construction and mining industries in terms of avalanches. Very-very quickly it is easy to give fairly accurate, within certain boundaries, predictions of how high the sand piles are going to be. And you can run the sand pile, hour after hour, day after day, and maybe tighten your parameters of the likelihood you can give probabilities BUT you can never know exactly of how the pile is going to be in five, ten minutes time, let alone ten days time, let alone a year's time. The weather is a similar system. There are a lot of biological influences to it but, in the same sense –at least in the short term- it is relatively easy to predict the weather. Give me some parameters, give me 5 degrees Celsius either side and I will be able to predict the weather for tomorrow or maybe in a week's time and maybe even in a year's time. I am in no way able to tell you all the causal factors that can build into it but because we have a good historical data set, I can tell you the weather within reason. Big thing on this, complex systems are not necessarily complicated: simple sand piles are extremely complex but complicated jet engines are not complex systems. You can watch jet engines over time and you can fairly accurately predict their behaviour.

So, all of a sudden you are looking at the 20th century and you begin to see a range of abiotic complex systems and you can say "fluid dynamics, weather forecast etc." and they begin to fit in between these orderly and disorderly phenomena. Whereas previously the expectation was that, over time, everything is going to wind up over the "orderly" box but, all of a sudden, you have this range of phenomena that aren't going anywhere as they are fundamentally complex and you still have the zone of the "unknown" and discovery.

What happens is that the "golden rules" of the "paradigm of order" begin to shift for abiotic systems in a "complexity paradigm":

- We now talk of *Partial Causality*: phenomena can exhibit both orderly and chaotic behaviours, cause may not lead to effect.
- *Reductionism* and *Holism*: some phenomena are reducible others are not.
- *Predictability* and *Uncertainty*: phenomena can be partially modelled, predicted and controlled.
- *Probabilistic*: there are general boundaries to most phenomena, but within these boundaries exact outcomes are uncertain.

And this is just physical complexity. Now you can easily take the next step and say: "what about in the living world, biological complexity?". A lovely book, if you don't already know it, dealing with this question is the "Frontiers of Complexity" by Peter Coveney and Roger Highfield (1995). A quote from this is: "Life is also an emergent property, one that arises when physiochemical systems are organized and interact in certain ways". I think that the person who takes this to its extreme is James Lovelock and the concept of Gaia, seeing the entire Globe as a super-organism.

It doesn't take much to view biological systems as complex systems built on top of existing physical complexity. And here you have plant-animal interaction, evolution over time (the concept of Gaia) and what that comes from is in essence that something is built on top of the physical complexity and we have a fifth "golden rule":

- Emergence: biological complex systems exhibit elements of adaptation and emergence over time.

In other words, the single-cell organisms that started out the evolutionary process, had that potential emergence built within them at the time that would eventually lead to us with tremendous amount of unpredictability, uncertainty etc. But held within them is that emergent property. You can run your sand pile for ever and ever and it will still be a sand pile but you can run a living system and you will be faced with a lot of change all over it: emergence!

So, how does all this relate to the field of social sciences? I would argue that the social sciences were highly enamoured with this world of order. The success of Newton, the power of industrial revolution made the mechanical vision extremely powerful. Thomas Hobbes

(1588-1678) in his work on the Leviathan talks about the need to have order within a society, mirroring the order that Newton was talking about; Francois Quesnay (1694-1774) views the economic system as a mechanical clock. I have a friend who is an economic historian and is also in computing, who went back and looked at the early equations that were set up by the classical economists and says that the cheeky economists copied them directly from Newtonian physics; they did not even alter the equations, they just stuck them directly and said: "this is the world of economics". In a lovely way, Condorcet (1743-1794) said that: "The sole foundation for belief in the natural sciences is the idea that the general laws directing the phenomena of the universe, known or unknown, are necessary and constant. Why should this principle be any less true for the development of the intellectual and moral faculties of man than for other operations of nature?" Of course! Human beings are just like nature, why can't we do this?

I would argue that this intellectual jump prevails in the social sciences. You have David Ricardo (1772-1823) talking about economic laws that were "as certain as the principles of gravitation" and Karl Marx (1818-1883) with the immutable laws of capitalist development. I would strongly argue that social sciences with modernisation in development theory, rational choice in politics, behaviouralism in sociology and positivism in economics had in essence a drift towards order and rule of the expert/ technocrat and often times support authoritarian social and political orders. If you knew what society was and new the right direction to an orderly societal state, you obviously had the right –in fact you were almost required- to brush away the elements that were opposing the drift to that direction because the were blocking the "appropriate" development of the society.

Of course, not everyone thought this way. Immanuel Kant (1724-1804) was saying that an organism, "cannot only be a machine, because a machine has only moving force: but an organism has an organising force… which cannot be explained by mechanical motion alone". Like I said, not everybody thought this way (according to the "paradigm of order"). Francis Hayek (economist/philosopher) was saying in 1958 that "in the field of complex phenomena the term 'law' as well as the concepts of cause and effect are not applicable". You can easily follow the hermeneutical tradition of Sigmund Freud and Max Weber where Freud said that we are not as rational as we think we are and Weber that institutions shape our thinking, so we are not that rational either. And this pushes you towards the postmodern tradition of Jean-Francois Lyotard challenging the "golden rules" of the "paradigm of order".

For me what's really exciting is that basically on top of this physical (abiotic) complexity there is conscious complexity. Human beings themselves are biological systems but we are also conscious of ourselves and the world around us. We create norms, values,

language, narratives based on our interpretation of the world, in other words we layer the complexity that is already built into our make-up with this element of consciousness. So moving to this world of conscious systems one more "golden rile" is added to the already existing five of the biotic world:

- *Interpretation*: the actors in the system can be aware of themselves, the system and their history and may strive to interpret and direct themselves and the system.

So, how does this all swing back in politics? Eric Hobsbawm wrote a lovely book saying that the 20th century was the "Age of Extremes", a real bestseller. I would argue though that instead of "age of extremes" it was the "age of order" where states due to technological development became capable of much higher degree of control than previously possible. The classic example is Soviet Communism. During the collectivization of 1930s, agriculture techniques were advanced, they had the experts to study it and say "right, we've got to get rid of the small inefficient producers, create collectives, we know we can do this". Bang, they established collectivization, agricultural production of course declined through the period leading to massive starvation of the population. Central planning, worked for some time with all functions controlled by the state, and the War itself. War is actually an orderly process in many ways, if you're fighting, which is actually why soviet communism was good at it, if society simplifies itself down, just a couple of objectives – survival, feeding the fighters- you can manage it. Nazism had a similar extreme process to it - a final solution, an order that led to a war, in essence competing with its neighbors because it literally couldn't adapt to the fact that the world wasn't falling into its orderly pattern.

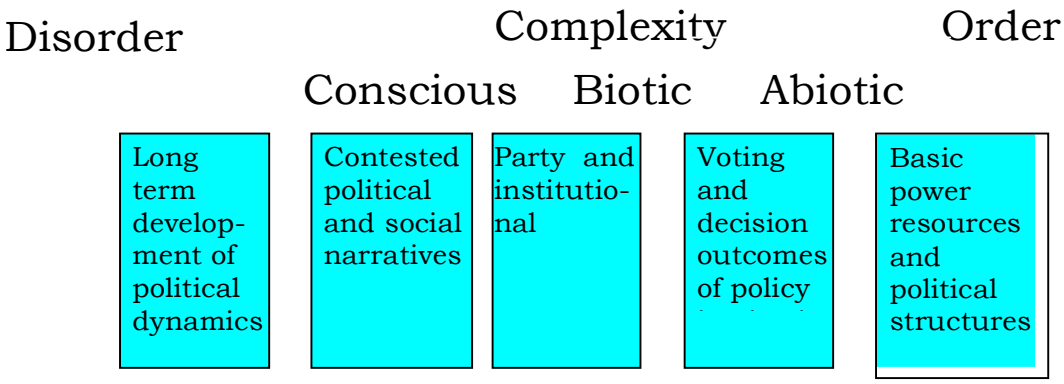
Alright, that's nice we can hold those extreme forms of order as the "baddies" but what about in the "normal" Western states? Actually, I would say that orderly paradigm shapes a lot of the policies that dominant states have towards the weaker states. I would argue quite strongly that the World Bank and IMF dominated by classic economic thinking it the '70's and '80s with the Structural Adjustment policy were able to inflict a vision of order onto a multitude of third world countries, completely ignoring their relevant complex unique histories. In other words, the simple vision was right: "we know what's good for these countries. They need more markets. We can easily establish some simple criteria that they have to fulfill and then we are going to hit them with it." Further " we realize that this is going to hurt in the short term and perhaps destroy a lot of the local markets. Others are going to starve in the process. But, in the long run it's going to be good for them." As we all know, the Structural Adjustment policies were a total disaster at the beginning, it's only when they started adapting and adjusting them that they quit being such a total disaster. I would argue that War on Terrorism, similar to the war on drugs, is carried out in a similar orderly linear framework. Establish

"baddies" - apply force - problem will be solved! The obvious difficulties in the War on Terrorism and the difficulties in the similar War on Drugs are due to the fact that they refuse to view them as a complex adaptive process and has led to a mess that I would easily argue that the British and the Americans are desperately trying to dig themselves out of. The Iraq war, the second one that we are dealing now, is a similar process. The belief that you can quickly order a complex adaptive process by the application of a large amount of force was absolutely wrong. The 'fighting bit' of it was relatively simple, overwhelming force was applied but actually altering the country and turn it into a democracy in a time span of a couple of months, maybe years demonstrated a phenomenal degree of difficulty. How could they possibly have thought this? Unless they were appealing to a fundamental framework that they knew how it would work in all over the place; they've convinced themselves.

One can easily say that internal policy actions are another type of order, as policies of powerful state actors on weaker state or non-state actors. I would argue, and we can go into this in more detail, that if you look at the health policy in UK in the last 10-odd years, the education policy in UK, there has been a phenomenal linearization of these policies based on a 'targeting culture' that has emerged. The example that I like to use in terms of health policy –education, I get hit with it everyday- is with a good friend of mine who is the head of Human Resources in a large hospital in Manchester is the difficulty with health targets that they all interact with each other. So my friend asks "how many targets you think I can 'hit' on a day" and I go: "I don't know 10 or 20?". "No way" he says "at the best I can hit maybe 5, because if I am supposed to reduce waiting lists, and do more breast cancer screening, I've got all my resources pushing one balloon". And he goes on: "do you want to guess how many targets I am required to 'hit' on a daily basis? Our last check was 320!". So I asked "how on earth you do it?" and he answered: "well, we ignore them! Unless there is a crisis with one of them, we pick a couple that we think that are 'key' ones, we pay attention to those and the rest we just ignore and we fill in the forms to make it all look happy". Imagine the tremendous amount of effort wasted in filling out forms to make it look happy! So fundamentally, I would say that logic doesn't have to wind up to the death of all sorts of people with these earlier cases we talked about but the policy? And you can easily go back to urban planning, coming from Liverpool, where you see areas of absolute disaster in terms of planning because the planners "knew this was the way people had to live". Of course, give it ten years of cooking and it turns out it's an absolute sinking state for multiple generations. In other words, the pursuit of order in the 20th century was all encompassing, not just 'evil' outsiders, external 'baddies'.

I would like to mention just a couple of concepts, now. One which I call complexity mapping.

Mapping Political Dynamics



What you have got in the right side is: "what is the most orderly bit of a political process?". You could say that basic power resources and political structures that are there over long periods of time, e.g., the Parliament itself, if I can look at the next ten years, I could say with a high degree of certainty that it will still be there. You can find order in political systems, no doubt. You then go on to the next one, "where are we seeing decisions that either have to fall on this, like sand piles, fall on and fall off like sand piles?" Voting behaviour; you either vote "yes" or you vote "no". Strangely enough, if you look at political science studies, all the modelling schemes were on voting behaviour, this was the one area where you knew that the decisions were one way or the other. So, in other words, you wouldn't have network modelling or multi-agent systems modelling doing this because here you can actually have hard data. Your 'biotic' ones, well, for politics that is easy: they are called political parties, living systems evolving in interaction with each other, fighting over resources (economic and vote resources, etc), the similarities are quite evident. Then, you obviously ask "where's the consciousness?" Well, the nature of the political structure is the powers and the norms, etc. And obviously, to me, what's the most disorderly bit is the long term development of all these. There are all sorts of "random accidents", how you deal with intrigues and conspiracy, a huge degree of disorder and all of these are going on at the same time. It's not that one happens or the other happens, they are all going through. And the actors on that system walk through it on a daily basis. I would argue that THIS is the norm; order is not the norm! I remember talking to policy actors, doing stuff on EU social policy, and I said "I am trying to get the larger picture here" to this actor who worked … I don't remember in which department was dealing with the interface of EU legislation and UK legislation …and he answered "The minute you figure it out, you tell

me, because we don't have a clue, I know only my little bit", which is a classic principle of complex adaptive systems where the individual actors have a broad idea of what the larger system does but they don't know, they are not aware of all the other interactions in it.

INSERT PICTURE OF THE STACEY DIAGRAM

Stacey's Diagram is so wonderfully powerful to me, because all you have to say is: "right, you have just got far-from-equilibrium, close-to-equilibrium, close to certainty, far from certainty". Then, you have decisions technically rational where everybody agrees on (we need to have another road built, we know how to technically do that), those types of decisions can fall to this category of decision making. The minute you start drifting to far-from-equilibrium (what kind of roads? do you want roads, trains, planes, what have you?) all of a sudden you are "political", if you will, then you are going to say "what are the new things that are going to emerge to make it more efficient?" and here you get the experts trying to make the best judgment the can. Then, you have all this area that Stacey calls "edge of chaos" (I think of it as "complexity area"), which is combining all these bits and pieces and then you have what he calls "disintegration and anarchy", which I would say is a further stop with the highest levels of uncertainty, highest levels of disagreement, where you do not have any clue. I think of that as the "long term". If you are sitting there with a group of people and ask "where do you want transport policy in fifty years time?" you get all sorts of stuff. The problem from our linear framework was that the drive was to get everything to the technically rationale decision making and so the push was to force everything down to this section. The irony is that this does not reflect reality. Reality is the complexity area but, for some reason, policy actors (and business actors too) saw as the rational area providing the answer. The exact same is happening with diabetic patients. Diabetic patients' problem is they want to see their thing reduced down here: "solve my problem, fix me, I'll hold still for you so long as you fix me". The problem is diabetes covers a much wider area. There are judgemental decisions to make (what's the best mixture for my diet? Exercise?), there are political decisions to make (how is the best way for a woman, a man, a child to be dealt in terms of this? How are the actors in that? How is the family?) –tons of complex decisions that are mixing all of these elements. There are technical ones (stop your insuline and you will get ill) that everybody agrees and you can easily have highly chaotic ones, which can be seen in something called "brittle diabetes" - a type of Type 1 diabetes in which the blood-glucose level fluctuates hugely, life expectancy of these diabetics is quite low, or let's put it in the long term nature by saying that a diabetic gets ill at the age of eight, where they are going to be in forty years time? How the diabetes shape their "sense of self"? So, in business, policy making, even diabetes for individual patients, the Stacey diagram is remarkably powerful.

INSERT PICTURE OF THE COMPLEXITY CASCADE

I also see complexity as "cascading". Think of it as, let say, abiotic phenomena, you start with the "big bang" which sets a lot of the parameters for the physical universe, and inside that one "gateway" event was the possibility of all forms of stars, planets, etc. that keeps going over time. Earth, 1.2 billion years BC: again a "gateway" event. Chemicals come together to make simple forms of life within which there is huge variety that leads all over the place. There are certain things that are impossible. For example, life forms made from mercury or something, but within certain boundaries life forms emerged. Steven Jay Gould, a great believer in evolution's unpredictability, wrote that if the "tape of life" were rewound and played again, a quite different set of organisms would emerge – no guarantee that human beings would wind up where they are. A similar thing occurs 50-100,000 years BC when it is estimated that languages emerged. You can call this an aspect of consciousness, the ability to communicate advanced conscious thought. The potential there for all the multitudes of social forms we are enjoying today, all those are contained within that "gateway". There are ones that aren't. The only think I can imagine that isn't is something like a social belief that you should kill yourself the minute you are capable of doing it. Well, this would not reproduce itself, so it would die out! And then you have this friend of mine who works on artificial intelligence. If we possibly could see the growth of some mix of human/machine intelligence that has a possible future but we don't know where this is going to go. This is the "big, grand scale". Now, let's take NHS 1945. A "gateway" event occurs and sets up its basic structure. A different shock occurs at a different time leading to a new structure. A cascade of continual collection, there is no end point, a cascade that clearly keeps rolling along. So, it's a way of thinking about complexity as a continual process rather than moving away from an end point vision of a linear order.

Going to democracy, from a linear point of view there is one main type: ours. It is endpoint in history, once it is established it stays. It is a Western creation with a key challenge: getting others to become democracies like us because fundamentally we are the ultimate form of social organization (see current activities in Iraq). From a complexity perspective, basic aspects, but multiple variations; emerging process; democratic tendencies throughout history, we were certainly not the first democrats and the key challenge: entrenching basics (meaning basic ability to give freedom of communication, freedom of choice to act to some degree) but also creating space for democratic exploration and development (meaning, for example, if a society elects monarchy, you actually have to live with it; if Palestinians elect Hamas, you have to say yes. The boundaries of a

democratic system are set so that it can work its way through this decision).

Freedom, I would argue is essentially the same. From a linear perspective, one main type, linked to free markets; endpoint to history (Francis Fukuyama); Western creation with key challenge: getting others to accept our "freedom". From complexity perspective, basic aspects of freedom (interaction), but multiple types; emerging process; concepts of freedom throughout history that vary quite radically; key challenge: continual exploration of freedom.

This fits for human rights as well. From a linear perspective, core rights, linked to free markets; endpoint in history; Western creation; Key challenge: getting others to accept our "rights". From a complexity point, basic rights, but multiple types- there is obviously the right to food, the right to interaction, the right to live, etc., but the minute you move beyond those core rights it gets awfully fuzzy, awfully quickly. The recognition of that fuzziness leads to the defense of basic rights but with continual exploration of new rights.

In essence it is a problem of balance. In the continuum "Order---Stifling Order---Creative Complexity---Destructive Disorder---Disorder" how to stay somewhere in the middle? For example, one of the reasons, the horrors of what has happened to Iraq is that it was pushed from a system of stifling order (the Saddam regime was in control of most of the systems for the last ten, twenty plus years) into a state of literally destructive disorder or chaos. It did not have a chance to settle in that attractor state of creative complexity and move to a fairly established regime. Montenegro, for example, could move somewhere in the middle, when they had the chance to vote for their independence from Serbia without war. In fact, the Yugoslav war, despite being sort of a failure of the EU, was actually a success of the EU because the EU itself did not go to war over it. The EU was designed to keep Europe from killing itself and, in essence, when the Yugoslav conflict blew up it did not trigger WWIII. That doesn't help the Yugoslavs but in essence it did work for the EU which kept peace internally.

Is there something in complexity to stop the powerful? There is nothing inherent in complexity to stop the powerful. In fact, there is a tendency of complexity to grow that mirrors growth in inequality. If you just look at the growing inequality in the 20th century in terms of advanced and less advanced flexibility and adaptability, here western countries are hit with massive industrial crises – sure it's a shock- but over time they just deal with these crises. Third world countries because of their limited degree of adaptability always struggle with those shocks that western countries are more capable to deal with. However, complexity does:

- Remove the veneer of scientific legitimation of particular "orders". In other words, when that NHS director says "these targets are critical because we have proven that, they are evidence-based", you can remove that by saying "your evidence is only reliant to a certain aspect and certain interpretation". No such thing as "final order", and, if anything, I can guarantee that, we are going to have more "final orders".
- Encourages diversity, interaction and expansion of complex learning and development
- Does not assume that individuals at the bottom are required to or must stay at the bottom. There is nothing in complexity that demands hierarchy, it recognises it but does not demand it.

No happy ending.

- Struggle, tension, difficulties are part of process
- Learning, uncertainty, mistakes never end
- Continual pursuit of balance, which gives us
- No big glorious rallying cry, "Be balanced?!?" that does not give many votes!!
- No final happy place, to go to or congratulate ourselves for our success. Fukuyama's book (The End of History and the Last Man) was so successful because it said "hey look! We are great! Liberal democracy (particularly the US model) is No 1! And it is going to stay that way forever" that was it! Tremendously happy, sort of, appealing thing.