SYSTEMS GAMES
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# Systems Games for Tipping Points and Adaptation CoP

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Notes, links and further reading

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## Accompanying Notes & Resources
Below are notes to (some sections of) the session (with slight differences due to changes on the day). Followed by links to websites, videos and books for further study and interest.

If you know any other groups or organisations who you think might like a workshop similar to this - or one of my in-person Systems Games or Improvisation for Uncertainty workshops then please do pass on my details [systemsgames@me.com or www.systemsgames.org.uk ] or put me in touch with them - thanks.

**About me**
Robin de Carteret is an educator, facilitator and consultant in participative education, complexity science and sustainability. He specialises in using experiential activities for investigation, learning and communication.

Robin focuses on a shift from looking at the world through a purely linear and mechanistic lens, to one where we understand the world as a highly interdependent network of living systems. He has developed a set of interactive activities that model the complex dynamics within organisms, communities, organisations, eco-systems, economy & society.

He works with organisations, businesses, schools, colleges, universities, local authorities, and community groups, locally and internationally.

# Notes

### Introduce myself + Starlings
Brief background. When I was a teenager - starlings - mesmerised. What are they doing, how are they doing it. I was concerned about environmental and social issues, and also interested in science, understanding how the world works. When I discovered complexity science I found this joined these 2 areas of interest. I felt like it showed up a blindspot in industrialised culture that was causing a lot of problems.

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I trained as a physicist but it was the Holistic Science course at Schumacher College where I learnt a lot of what I will be presenting today. Since then I've worked in Education for Sustainability. I worked with 70 schools running a whole school sustainability programme. Was a co-founder of transition Leicester. Now I run a company called Systems Games - work with organisations, staff teams, universities, events, conferences. I also teach and facilitate at Schumacher College. I run nature connection activities and I

have just finished building zero-carbon Passivhaus Plus home.

We often think of complexity as something to be minimised/ For me complexity is awe inspiring and beautiful - so my question is  just as we need to create positive vision of a transitioned and resilient world I would like to create a positive vision of complexity and seeing it as a positive creative force - one that allows more win-win situations than linear thinking. Understanding complex living systems can teach us a lot about resilience to climatic change - as species and eco-systems have been evolving for millions of years.

## Applause to Clapping in time

I want to start with a little experiment - I mostly work in person with groups and this is quite a new activity online. We're going to create a mini complex system - with various feedbacks. . When I say go I want you to give a round of applause - but then I want you to watch when I put my hand up - when I put my hand up I want you to choose one other person and clap in time with them.

If this does synchronise then…
An example of how you just have to hold your piece and the whole system can change
If we can find the right change in behaviours and get the right connections in the system we can change the whole system without having control over it in a top-down way. Leaders can be inspiring but in this case there was no leader - the change emerged from the actions of all of you. The tipping point report is highlighting areas where we can have a relatively small behavioural change to create a large and lasting effect in the larger system.

(If this doesn't synchronise then - we all had our individual goals there - of clapping in time with someone - but we didn't have a shared vision - a vision of what the future could be like. So if I said our shared vision was to all clap in time. Then let's try this again - this time there is still no leader - but you can use your judgement of how to all clap in time - your might want to follow the rhythm of the most people clapping.)
These 2 first work in in-person groups but on Zoom this happens:

If it never synchronises then this is what it can sometime feel like working with a complex system, where we can't control it and can only do our part. In this case it may never synchronise due to delays. Delays can completely change the behaviour of a complex system (where a simple system would just be delayed) like you get with a caravan snaking.  But understanding that the delays are causing the problem can mean you can make it work (like not over steering and just holding steady even though your instinct is to brake and correct the steering.) Just understanding there is a feedback loop with delays here could mean the difference between a crash and recovering before you have a crash.

## Why are we are facing multiple Ecological, Financial and Social Crises

We are facing multiple Environmental, Economic & Social Crises. Climate change, Antibacterial resistance, resource depletion, financial instability, fear-based divisive politics, automation taking jobs.

So why are we facing these multiple crises and disruptions? One way to look at it is that the our world is increasing in complexity. Globalised World - a bigger whole systems with more parts. Highly Networked - more connections. Increasing Speed of Connections - faster internet, video calls across the world, fast travel. All 3 of these things leads to higher complexity.

Our way of thinking hasn't caught up with our scientific understanding of the world. We still tend to think in a mechanistic, linear way with the idea of simple cause and effect.  Our mainstream use of linear thinking and 'predict and control' is increasingly unfit for purpose.

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What is extra puzzling is that we know we are causing these problems but we don't seem to be able to change. Like this man on the tree - its suicidal - but he just needs the wood. This suggests to me there is something fundamentally wrong with the system.
If our society was a person it would either be locked up for being a psychopath - or at least given serious help for being suicidal!

Albert Einstein said "we can't solve problems by using the same kind of thinking we used when we created them." We need a mindset shift…

## Mindset Shift: Circles in the Air and Arms Folded

Circles in the air demonstrates how we can have different perspectives about reality depending on the how we look at things. (Point your finger up in the air, look up at it and circle your finger in a clockwise direction. Now bring your finger down below your face while still circling in the same direction. Which way is your finger circling now? Anti-clockwise!)

Arms folded demonstrates how it can be uncomfortable and difficult to shift our mindset -(Fold your arms. Now notice which arm is on top. Now unfold your arms and fold them again but this time with the other arm on top. How does that feel? - Most people say, weird, difficult, uncomfortable, "you had to think about it" etc.). Sometimes there are psychological barriers that protect us from painful experiences. For example really accepting the reality of climate change is to realise that we are partly responsible for the deaths of millions of people through droughts, floods, storms and the extinction of 1000s more species over the coming decades. Its often easier to deny, either that its happening, or that there's anything you can do about it. I think we need stories of positive change because I think we need hope and a sense of how great it could be if we came together to be worth accepting that pain.
The other thing is that seeing the world from a new perspective is clunky at first. You need to concentrate and practice, but then soon it does become second nature. So we need to practice - so lets practice thinking in systems a bit more…

## Thinking in Systems

**Thinking in Systems**
Why is this view not more prominent?
Our world view is based on a different set of assumptions:
Reductionist Science,
Certainty,
Control,
Linear Thinking,
Cause and Effect

This has allowed us to create amazing machines but...

Reductionist Science (which works by splitting things down into smaller parts to study them), The assumption that if you understand something you can have Certainty about how it will behave and therefore Control it, It emphasises Linear Thinking where A causes B but we don't include the influence that B has on A – so we ignore the feedback loops. But all of this has allowed us to create amazing machines technology – so its not to say that we should get rid of this way of thinking but...

**Many of the Systems we work with are Complex Systems – and they don't work like machines.**

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# How to take action on global challenges

So how do we best work with complex systems - what is the best way to act?

**When you try to control**, you restrict, which can destroy intelligence & integrity
Complex Systems are not actually controllable

**They are inherently unpredictable** – although if you work with them you can get to know how they behave. You can train a dog – create a relationship with a dog – and they will o]en do what you'd like them to do – but can actually control them and know for sure what they will do.
When we act as if we can control a complex system – we usually cause un-intended problems

**Why are we facing Ecological, Financial and Social Crises?**
When we act as if we can control a complex system – we usually cause un-intended problems. I think we are facing an ecological crisis, a financial crisis, and a number of social crises. One way to understand why this is happening is that we are trying to apply a mechanistic and simplistic market model to complex dynamic systems.

**The world is interconnected**
**We can't help but participate**
**How do we participate in a sensible and responsible way?**

**From Control to Participation**
Examples:
Conventional chemical based monocrop farming to Permaculture ==> or other integrated organic system
Centralised large fossil fuel energy production ==> community owned small scale renewable energy
Hierarchy and lines of command ==> Holarchy, Cooperatives, Emergence, Self-organisation
Simplistic prescribing of drugs for health problems ==> Preventative medicine, promoting healthy lifestyles

**But won't relinquishing control mean Chaos? If we want order, don't we need centralised control systems?…**

## Equidistant Game (Description below is for the in-person game which we simluated reasonably well on Miro with our cursors.

Lets try it out in a minute I want us to model a complex system and experience chaos and order - but first I want to show you an example of order emerging out of chaos in a slime mold.

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Film showing single celled slime mold coming together to form a super-organism that looks like a slug. It has intelligence without a brain, or nervous system, its an emergent property of the way the single cells are interacting with each other. This is a form of distributed intelligence rather than the centralised/top down control we are used to.
We are now going to simulate a slime mold and other complex systems with an interactive activity where you will each choose 2 others to follow. The aim is for you to stand equidistant from your 2 chosen people. We will all try to do this at the same time. No one is leading but we will have lots of chaotic movement but then the amazing thing is we are likely to stabilise This is order coming out of chaos - and it is a feature of all complex systems. So we will see emergent group properties coming from the interactions that would be impossible to predict. We also can't control the system in the normal way because we can't fully predict what effect we will have. At the stabilisation point we can see a tipping point. Imagine that you are all parts of the climate system each of you are representing sea temperature, ice cover in the arctic, Amazon rainforest, CO2 levels etc. If we push one element like CO2 by burning fossil fuels what happens? One person takes a very small step. This will affect the whole group. The system may stabilise (balancing feedback). Then take one more step - this may then take the system past a tipping point. The system then goes back into chaos and eventually finds a new stable point. This would be very bad for the habitability of the planet in the climate example. But not to end on a purely worrying point, this ability of complex systems to change like this can also represent social change, which is also a complex system. Just one person, or team of people, with an inspiring idea could cause a radical shift in social and cultural thought and action. This balance of balancing feedback loops and re-enforcing (runaway) feedback loops gives a complex system resilience. Controlling systems too much kills innovation and adaptability so we need to find the right balance.

**Understanding about tipping points is essential to realise how dangerous a predicament we are in in terms of the urgency of climate action. But the possibility of positive social tipping can also give us hope that we can change fast enough to avoid going past climate tipping points. We need to find the right leverage points to**


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**speed up reaching positive social tipping points in things like the uptake of renewables, regenerative farming, rewilding, plant-based food, electric vehicles and green hydrogen.**

## What does this mean in practice?

- Edge of Chaos
- Dual Nature of Organisations
- Linear thinking to Circles of influence
- Donut Economics - many win win situations - like in Wilding book - its not Agriculture pitted against wilding - And similarly its not poverty reduction pitting against environmental issues - we all benefit when nature benefits.
- Thinking more broadly about transition to zero carbon
- What are some examples in your work of applying a broader systemic view? - Talk in pairs- then share to the group.

## Balancing Tubes

So in the Equidistant game we saw a tipping point happen. I just want to go a bit deeper into how this happens. Its caused by feedback loops.
There are just 2 types of feedback.
Lets try this out physically.
We went from purely re-enforcing feedback to a balance where re-enforcing still dominated to finally one where balancing took over and the whole system was in dynamic balance.
Systems generally have a mixture of both re-enforcing and balancing feedbacks. A tipping point can happen when the comparative strengths or influences shift.

**Examples of re-enforcing dynamics:**
Peacock tail
More exercise - feel better
Rich Getting Richer
Population Growth
Economic Crash/Bubble
Promising employee/pupil get more attention from employer/teacher and therefore does better as 'expected' (self fulfilling prophecy.) Or shy student is ignored and does worse and worse. A vicious cycle.
More physical exercise - feel better and more fit and want to get out more and do more exercise.
New products grow through word of mouth - also a virtuous cycle.
Retweets, liking, favouriting on social media all create the possibility of something going viral.

**Balancing Dynamics**
Shivering/ Sweating
Supply and Demand
Resistance to change
$CO_2$ / plant growth
Whereever there is resistance to change there is a hidden balancing feedback in process. Often there is an implicit goal (like working a 70hr week) so even if you know your staff are over worked and underperforming and you try to force them to work less by locking the office or having strict rules about not working overtime the system may not change until you change the implicit goal that you as a successful manager who works 70hrs a week has set. Often need to change the norms and the relationships to make real change.

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Books and Links to Resources on following pages...

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# Books and Links to Resources

Although I have lifted some of the descriptions directly from organisations' websites – I personally recommend all of the following books and links…

**www.systemsgames.org.uk**
Robin's website: Participatory education, facilitation, and consultancy in complexity science and sustainability.

**www.schumachercollege.org.uk**
A pioneering College providing a range of postgraduate, vocational and short courses for transformative learning and a sustainable future. Including an MSc. in Holistic Science, MA in Economics for Transition and Certificate in Eco-Design.

## Communication

**Nonviolent Communication: a Language of Life** by Marshall B. Rosenberg
I can't more highly recommend Marshall Rosenberg and his books and talks.
http://www.nonviolentcommunication.com
https://www.cnvc.org/about-us/projects/nvc-schools/nonviolent-communication-schools

A brief introduction on YouTube:
https://www.youtube.com/watch?v=DgaeHeIL39Y
A longer and brilliant full session with him: https://www.youtube.com/watch?v=YwXH4hNfgPg (get past the song it gets much much better!)

## Working with Children

**How to Talk So Kids Can Learn. by Faber, Adele and Mazlish, Elaine. (1995)**
I found this book so useful, often seemingly counter-intuitive ideas that I now really value (like not praising children but describing what they have done)
**http://www.fabermazlish.com**

**Life-Enriching Education: Nonviolent Communication Helps Schools Improve Performance, Reduce Conflict, and Enhance Relationships** by Marshall B. Rosenberg

**Planting Seeds:** Practicing Mindfulness with Children
Thich Nhat Hanh Edited by Sister Jewel

## Materialism, Values, Happiness

**http://valuesandframes.org**
Very good work on what we value and how important framing is in communicating about sustainability. Free download of the Common Cause Handbook.

**www.neweconomics.org/publications/entry/happy-planet-index-2012-report**
The Happy Planet Index is a new measure of progress developed by the New Economics Foundation, that focuses on what matters: sustainable well-being for all. It tells us how well nations are doing in terms of supporting their inhabitants to live good lives now, while ensuring that others can do the same in future.

**www.localfutures.org**
International Society for Ecology and Culture (ISEC)
Promoting Locally Based Alternatives to the Global Consumer Culture. (ISEC) is a non-profit organization dedicated to the revitalization of cultural and biological diversity, and the strengthening of local communities and economies worldwide. Their emphasis is on education for action: moving beyond single issues to look at the more fundamental influences that shape our lives. Founded by Helena Norberg-Hodge

## Systemic Thinking in Organisations

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**Reinventing Organizations: A Guide to Creating Organizations Inspired by the Next Stage in Human Consciousness**
**by Frederic Laloux**
Fantastic book on organisations that operate from a living systems mindset. With case studies of wildly successful companies operating from that paradigm
Donate what you want for the ebook…
**http://www.reinventingorganizations.com**

**Reinventing Organizations: An Illustrated Invitation to Join the Conversation on Next-Stage Organizations**
**by Frederic Laloux and Etienne Appert**
More concise and illustrated version of the above book.
Donate what you want for the ebook…
**http://www.reinventingorganizations.com/pay-what-feels-right.html**

**www.systemsthinking.co.uk**
John Seddon's organisation Vanguard – Systems Thinking for Service Organisations. Vanguard helps organisations change from command and control to a systems approach to the design and management of work.

**John Seddon, Systems Thinking in the Public Sector: The Failure of the Reform Regime.... and a Manifesto for a Better Way (ISBN-10: 0955008182)**

**Margaret J. Wheatley, Leadership and the new science: Discovering order in a chaotic world. Third edition**

**Nick Obolensky, Complex Adaptive Leadership**

**Giles Hutchins, The Nature of Business: Redesigning for Resilience (ISBN 0857840487)**
Giles Hutchins presents the challenges to the prevailing 'business as usual' model, explains the pressing need for transformational change, and reveals the concepts and mindsets necessary to inspire the businesses of tomorrow.

**Eve Mitlton-Kelly**
The LSE Complexity Group has been working for over 20 years, with organisations in the private and public sectors to address practical complex problems. In the process it has developed a theory of complex social systems and an integrated methodology using both qualitative and quantitative tools and methods.
**http://www.lse.ac.uk/researchAndExpertise/units/complexity/home.aspx**

## Systemic Thinking

**Fritjof Capra, Web of Life: A New Synthesis of Mind and Matter (978-0006547518)**
Fritjof Capra is at the forefront of the revolution in modern science which has challenged a conventional mechanistic view of the world based on the thinking of Descartes and Newton and brought us towards a holistic, ecological view. Here, Capra offers a synthesis scientific breakthroughs such as the theory of complexity, Gaia theory, chaos theory and other explanations of the properties of organisms, social systems and ecosystems

**Fritjof Capra, The Hidden Connections (ISBN 9780006551584)**
Capra demonstrates how tightly humans are connected with the fabric of life and makes it clear that it is imperative to organise the world according to a different set of values and beliefs, not only for the well-being of human organisations, but for the survival and sustainability of humanity as a whole.

**Donella H. Meadows , Thinking in Systems: A Primer (ISBN 1844077268)**
Thinking in Systems is a concise and crucial book offering insight for problem-solving on scales ranging from the personal to the global. This essential primer brings systems thinking out of the realm of computers and equations and into the tangible world, showing readers how to develop the systems-thinking skills that thought leaders across the globe consider critical for 21st-century life.

**Donella H. Meadows Places to intervene in a System** [Free download: www.donellameadows.org/wp-content/userfiles/Leverage_Points.pdf]

**www.santafe.edu**

Santa Fe Institute - Science for a Complex World. The Santa Fe Institute is an independent research and education center, where scientists collaborate across disciplines, merging ideas and principles of many fields -- from physics, mathematics, and biology to the social sciences and the humanities -- in pursuit of creative insights that improve our world.

www.complexityexplorer.org
The Complexity Explorer site is being developed by the Santa Fe Institute and provides online courses and other educational materials related to complex systems science.

**Systems Thinking Playbook – by Linda Booth Sweeny.**

## Systemic Biology and Deep Ecology

**Brian Goodwin, How The Leopard Changed Its Spots: Evolution of Complexity (ISBN 0684804514)**
My inspiring former tutor, Brian Goodwin, builds on Darwinism with a theoretical construct that admits that complexity is an inherent and emergent quality of life. He demonstrates that organisms are as cooperative as they are competitive, as altruistic as they are selfish, as creative and playful as they are destructive and repetitive.

**Ian Stewart, Does God Play Dice?: The New Mathematics of Chaos (ISBN 978-0140256024)**
Practical applications of chaos theory, such as developing intelligent heart pacemakers.

**James Lovelock, Gaia — the Practical Science of Planetary Medicine (ISBN 0195216741)**

**Stephan Harding, Animate Earth: Science, Intuition and Gaia (978-1900322546)**
My Inspiring former tutor, Stephan Harding explores how Gaian science can help us to develop a sense of connectedness with the more-than-human world. His work is based on careful integration of rational scientific analysis with our intuition, sensing and feeling

**Wilding: The Return of Nature to a British Farm, by Isabella Tree (ASIN : B07S8C68VV)**
Very inspiring and practical account of how allowing nature to do its thing can be not only remarkably good for all the creatures and wildlife that we so desperately need to protect but also for carbon capture, flood protection, much healthy food, stopping erosion, cleaning up pollution, and actually often higher productivity.

## Systemic Thinking in Healthcare

**Knut Schroeder, Trevor Thompson, Kathleen Frith, & David Pencheon, Sustainable Healthcare (978-0470656716)**
Sustainable Healthcare gives an evidence–based overview of the topic and includes case studies. It is a comprehensive and practical review of the complex issues that surround the development of sustainable medicine.

## Practical responses and Transition Towns

www.transitionnetwork.org
Transition Network is a charitable organisation whose role is to inspire, encourage, connect, support and train communities as they self-organise around the Transition model, creating initiatives that rebuild resilience and reduce CO2 emissions. Ultimately it's about creating a healthy human culture, one that meets our needs for community, livelihoods and fun.

http://transitionnetwork.org/blogs/rob-hopkins
Brilliant blog by the founder of Transition Towns, Rob Hopkins.

**Rob Hopkins, The Transition Companion: Making Your Community More Resilient in Uncertain Times (ISBN 978-1900322973)**
Shows how communities are working for a future where local enterprises are valued and nurtured; where lower energy use is seen as a benefit; and where cooperation, creativity and the building of resilience are the cornerstones of a new economy.


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**www.bioneers.org**
Bioneers is a non-profit organization based in USA that highlights breakthrough solutions for restoring people and planet. They are inspiring a shift to live on Earth in ways that honor the web of life, each other, and future generations.

**www.ellenmacarthurfoundation.org**
Very practical and successful new organisation "inspiring a generation to re-think, re-design & build a positive future through the vision of a circular economy."

**www.cat.org.uk**
One of the original experiments in sustainable living. CAT is an education and visitor centre which demonstrates practical solutions for sustainability. They cover all aspects of green living: environmental building, eco-sanitation, woodland management, renewable energy, energy efficiency and organic growing - a living laboratory with an enormous range of live examples of sustainable solutions.

**www.thornhill-ecohouse.org.uk**
Robin's other website: A guide to making homes more sustainable. See an example of ecological design with tips on what you can do.

**www.upcycling.co.uk**
People sharing ideas on turning waste into something better.

## Climate Change and Planetary Boundaries

**www.carbonvisuals.com**
Carbon Visuals is a business dedicated to helping everyone better understand carbon emissions. Through images and animation they draw attention to the causes of climate change rather than the effects.

**Rockström Report on Planetary Boundaries.**
National Environmental Performance on Planetary Boundaries
Authors: Björn Nykvist, Åsa Persson, Fredrik Moberg, Linn Persson, Sarah Cornell, Johan Rockström
Swedish Environmental Protection Agency. ISBN 978-91-620-6576-8.
[Free download: www.stockholmresilience.org/21/research/research-news/6-28-2013-a-safe-operating-space-for-sweden.html]

**www.Dothemath.org**
Campaign from 350.org that recognises that there is 5 times more CO2 contained in the already discovered declared reserves of fossil fuels than is safe to burn if we are to avoid causing catastrophic climate change.

**www.350.org**
Great campaigns and projects to get involved in that recognise the scale of the climate crisis we are facing. 350.org is building a global grassroots movement to solve the climate crisis. To preserve our planet, scientists tell us we must reduce the amount of CO2 in the atmosphere from its current level of 392 parts per million to below 350 ppm.

## New Economics

**Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist, by Kate Raworth**
New visual language for changing economics. Fanatically clear and simple ways of looking at how we think about what we really need economics to do for us in the modern world.

**www.reconomy.org**
A Transition Network project links local economics, enterprise, resilience, community, Permaculture, peak oil & climate change. Tools to help build a new kind of local economy

**www.moneylessmanifesto.org**
Drawing on almost three years of experience as The Moneyless Man, Mark Boyle not only demystifies money and the system that binds us to it, he also explains how liberating, easy and enjoyable it is to live with less of it.

**www.charleseisenstein.net**

Charles Eisenstein is an author and public speaker (one of the best speakers I've ever heard!), and self-described "degrowth activist". He is the author of the 2011 book Sacred Economics.

**www.neweconomics.org**
Economics as if people and the planet mattered. The new economics foundation is an independent think-and-do tank that inspires and demonstrates real economic well-being.

## Improvisation

**Impro: Improvisation and the Theatre. Book by Keith Johnstone ISBN 0-571-10989-6, 9780571109890**
Where I got inspired to do impro. I love his focus on letting the story emerge. A great read.

**Do Improvise – Less push. More pause. Better results. A new approach to work (and life) by Robert Poynton**
https://thedobook.co/products/do-improvise-less-push-more-pause-better-results-a-new-approach-to-work-and-life
Great little book with excellent games and exercises focused on using impro in business and organisations.

**Impro for Storytellers. Keith Johnstone. ISBN: 9780571190997**
**http://www.faber.co.uk/catalog/author/keith-johnstone**

**The Improv Handbook: The Ultimate Guide to Improvising in Comedy, Theatre, and Beyond. by Tom Salinsky, Deborah Frances-white**
**http://www.goodreads.com/book/show/3143028-the-improv-handbook**
My teachers in London.

**http://appliedimprov.ning.com**
The AIN (Applied Improvisation Network) is a community of practitioners and clients who value the use of improvisation skills in organizations to: improve relationships, increase authenticity, promote spontaneity, foster trust, build communities of practice.