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VALUES, WORLD SOCIETY AND MODELLING YEARBOOK 2017

INTRODUCTION AND OVERVIEW

Draft of Chapter 1 for *Values, World Society and Modelling Yearbook 2017*

Trends continued: global warming; advancing technology; the dominance of the USA; rapid growth in India and China; and sometimes religious strife amongst Christians, Muslims, Buddhists, Jews and others. The volcanic outbursts from Donald Trump, the new president in the White House, contrasted with the assured mastery displayed by China's Xi Jinping at home and globally. Trump's style caused nervousness at home and around the world. China's activities caused nervousness among its Pacific neighbours. North Korea continued its nuclear missile development in the face of angry words from Washington, UN resolutions, sanctions and diplomacy. Vladimir Putin's relations with Russia's near neighbours – the Baltic states, Ukraine, Turkey, Syria and Iraq – created nervousness in the West. Joint, though separate and not always harmonious, action involving both Russia and the USA succeeded in rolling back Isis in Syria and Iraq. Saudi Arabia and Iran continued their involvement in the disastrous situation in the Yemen. In Europe, Catalonians were divided in their opinion about staying in Spain or leaving; Brexit discussions continued within the UK and between UK and the European Union as a general election produced a minority government; in France the astonishing ascent of centrist Macron took him

to the presidency; and Angela Merkel struggled to form a centrist coalition in Germany while in Austria a coalition formed involving the far right. President Maduro entrenching his leftist government in Venezuela. Anarchy continued in Libya while in the south of the continent the long rule of Robert Mugabe in Zimbabwe ended, and the position of President Zuma of South Africa weakened. The Rohingya refugees fled persecution in Myanmar.

The 2017 Yearbook looks at the year from a *Values, World Society and Modelling* perspective, selecting a few events and topics that are explored in greater depth. Like its predecessors, it makes no attempt to be a comprehensive or representative account of the year's events. It draws on the monthly issues of the *Commentary* which were produced during the year under the banner of *A New Agenda*.¹ *A New Agenda* seeks to explore all aspects of society using all the academic disciplines paying special attention to values ... with special interest in modelling ... not disinterested in practice ... and aspiring to high academic standards. The rationale for the New Agenda is discussed in more detail in the 2014 Yearbook.²

Overview of the chapters

- 2 World Society in 2017
- 3 Rules in Cultural Space: Age, Gender, Ethnicity and Religion
- 4 UK, 2017: Mass and Gravity in Political Space
- 5 Space and Power Trajectories: Western Dominance and Eastern Growth
- 6 Formation Dynamics: Environment, Technology, Economics, Politics, Religion
- 7 Value Trajectories: Wellbeing, Wealth, Health, Peace and the Environment
- 8 Knowledge Trajectories: Fermat's Last Theorem and Modularity

2 World Society in 2017

The aim of this short chapter is to try to get an idea of what it might mean to talk about what happened in world society in 2017.

¹ Burt, Gordon. "A New Agenda." Accessed 1 June 2015.

<https://sites.google.com/site/gordonburtmathsocsoci/home/a-new-agenda>.

² Burt, Gordon. *Values, World Society and Modelling Yearbook, 2014*. Newcastle: Cambridge Scholars, 2016, xii, 1-3.

What happens each year is a unique mixture of the prosaic and the sensational; the normal and the notable; continuation and change; good and bad, positive and negative; and betterment and deterioration.

News stories tend to select the sensational and the negative. What happens involves a structure of actors in a structure of relationships which have an ongoing trajectory over time.

The year's headlines. Trends continued: global warming; advancing technology; the dominance of the USA; rapid growth in India and China; and religious strife amongst Christians, Muslims, Buddhists, Jews and others ...

An insight into everyday activities is provided by the average household weekly expenditure in the UK. However what is normal everyday activity for the average British household is not the experience of everyone in world society. The homeless in the UK; the cholera cases in the Yemen; the Rohingya refugees from Myanmar; and two million people in Guinea-Bissau with a GDP equal to what Prince Mohammed bin Salman of Saudi Arabia paid for a painting, a yacht and a chateau.

One day's news provides an insight into the complex structure of relationships existing in world society. Conflicts were present in relationships involving the social divisions of race, nation, religion, politics, class, gender, age and sexual relations.

3 Rules in Cultural Space: Age, Gender, Ethnicity and Religion

This chapter is about how different social groups relate to one another and how social divisions manifest themselves in the different systems of society: in the political system, in the justice system, in the education system, etc.

A senate election in Alabama illustrates how age, gender and ethnicity can divide societies and how they can manifest themselves in voting behaviour.

The rest of the chapter focuses on the justice system. A variety of models is presented of how rules operate in society. The simplest model is that each individual either follows a rule or they do not. In the signal-detection model an individual is or is not a rule-follower; and society classifies them as a rule-follower or does not. There may be differential treatment. Each of these models has a multi-stage process version. Models of groups and populations can be based on models of individuals. The propensity of an individual allows us to define a group's rule-following propensity. Equations relate propensities to prevalences.

The situation in prisons in the UK is studied. Gender is the social division most strongly associated with prison: the prison population is overwhelmingly male – specifically, the male prison propensity is 24 times the female prison propensity. Prison propensity is high amongst the young. The majority of prisoners are white, but black people have a much higher prison propensity, 4 times higher. The majority of prisoners are Christian, but Muslims have a much higher prison propensity, 4 times higher. Also, in Scotland, Muslims have a high relative male/female prison propensity.

Different offences have different prison propensities. The relative offence propensities are much the same for men and women, but men have a greater propensity for sex-related offences. Here, z-scores are used.

There are problems making international comparisons, but leaving these aside sizeable differences in prison propensity are observed between countries. There is also a distinct geographical pattern: within Europe, a western bloc of countries has low prison propensities and an eastern bloc has high prison propensities.

The Lammy Report, discussed Black, Asian and Minority Ethnic (BAME) over-representation in the UK Criminal Justice System and identified a variety of factors. Stop and search exhibits differential policing. Sociological studies of differential policing in the USA are noted and related to the police shooting of a homeless man in Skid Row in the USA. The shooting of a black man by a citizen in 2013 prompted the formation of Black Lives Matter. In Charlottesville contention about the history of slavery led to fatal confrontation between white supremacists and anti-racists.

There are encounters in prison: prisoners with prisoners, and prisoners with prison staff. There are almost as many harming incidents in prisons as there are prisoners, 60% of these concern self-harming and 40% other-harming, and 74% concern harming fellow prisoners and 26% harming staff.

The recent Newcastle case of ethnicity and sex grooming prompts a consideration of a report produced in 2012. “There were 16,500 children in England who were at high risk of child sexual exploitation.” The evidence is incomplete. The situations are varied and complex. The offence is a horrendous but somewhat rare event. It is carried out by groups on several individuals. It is about young and middle-aged adults harming children. It is mostly about men harming women - but there are a few male victims and a few female perpetrators. White people are underrepresented in both victim and perpetrator populations. Black people are highly over-represented in both victim and perpetrator populations.

Asian people are underrepresented in victim populations but highly overrepresented in perpetrator populations.

Just as in politics we can think of voters voting for parties which are near them in political space, so we can think of citizens obeying rules which are near them in cultural space.

There are links here to the discussion in the 2014 Yearbook of how gender differences manifest themselves in literacy and education worldwide. Also the manifestation of social divisions in voting behaviour is a feature of a number of previous analyses.

4 UK, 2017: Mass and Gravity in Political Space

The election wasn't supposed to happen in 2017 and Theresa May wasn't expected to lose her majority. The events surrounding this surprising election are discussed in the first part of the chapter and the modelling of the results is presented in the second part of the chapter.

Six headlines between March and June tell the story of the campaign. The road to the election in 2017 is traced from the election in 2010 to the election in 2015, to the Brexit referendum of 2016 and the April 2017 decision to call an early election. The results of opinion polls, local elections and by-elections in this period are noted ... and then the final excitement of the election morning headlines and the exit poll. The political process concentrated power, transforming the voting results into seats in parliament and into government. It changed the distribution of power. The government had lost its overall majority but as the leader of the largest party, Theresa May, reached an accord with Northern Ireland's Democratic Unionist Party and formed a minority government. Labour gained votes and seats. Some parties lost representation or experienced decline, big names fell, party leaders resigned or were weakened. In particular there was increased pressure on prime minister Theresa May.

Age and newspaper readership had a strong link with party preference – whereas gender had only a weak link. The list of social categories in order of increasing strength of association with party preference is: gender, class, job sector, home, education, work, nation, age and media (newspaper readership). In the south, seats were mainly Conservative whereas in the north and in London fewer seats were Conservative.

Thinking in terms of models, the results can be represented as points in percentage space or in terms of an order function or as a distribution in political space. Comparing the 2015 and 2017 elections, volatility (which is related to modular distance in percentage space) was greater for votes than it was for seats. The biggest party's share of the vote increased from

2015 to 2017 and this was reflected in a difference in the order functions. Labour in the centre-left of political space was the major gainer. Flows in political space followed a gravitational law. The results of the 2017 election are discussed in relation to the party vote trajectories over the period 1945 to 2015.

5 Space and Power Trajectories: Western Dominance and Eastern Growth

Events occur in physical space and depend on the physical configuration of space. In particular human events depend on the configuration of planet earth, on its geography - and they also depend on technology. Changing geography and changing technology changes the nature of events.

Movements of people, objects, ideas and information generate interactions. Interactions may involve the projection of power. The structure of power in world society is a major determinant of the structure of value outcomes. The pursuit of value leads to the pursuit of power. This creates pressure for change to the power structure, generating power trajectories, leading to the rise and fall of dominant powers. Events and anniversaries in 2017 illustrate these general points.

Land and sea travel began in pre-history but air and space travel and radio communication have only been developed in the last hundred years or so. Only in the last six hundred years has there been significant contact between Europe-Asia-Africa and America and other land masses. Within Europe-Asia-Africa the primary long-distance route was a land route, the Silk Road, but this was superseded from the 1400s onwards by the Europeans with a sea route from the Atlantic Ocean to the Indian Ocean and then the South China Sea.

The passage of a Chinese naval flotilla through the English Channel prompts Paul Kennedy to reflect on the 500-year rise of Western naval power and its current waning in the face of growing Asian naval power. Also, contestation between Western powers has waned and contestation between Eastern powers has grown. Within the West, mastery has shifted from Europe to America. Within Europe, mastery had earlier shifted from Mediterranean states to Atlantic states. There, power shifted from Portugal and Spain to the Netherlands, France and Britain. Within Asia, power has shifted from Japan to China. These points are evidenced by the current and projected naval balance and also by the rise and fall of US Ship Force Levels between 1886 and 2016. In the last few years, with the growing power of China, there has been a return to the idea of the Silk Road.

Britain's control of Hong Kong ended in 1997, its control of India ended in 1947 and its control of Palestine ended a year later in 1948. The British Indian Empire gave way to the independent states of India and Pakistan in 1947, with East Pakistan becoming Bangladesh in 1971. In India the party which was dominant at independence has declined. The Balfour Declaration of 1917 paved the way for the foundation of the state of Israel, following the mandates of Britain and France over parts of the defeated Ottoman Empire, thus changing the population balance in Palestine.

The land powers of Europe and the Middle East – the Ottoman Empire, the Austro-Hungarian Empire and the Russian Empire - collapsed following defeat in the First World War. The first two empires were dismembered and the third was diminished. The Russian Revolution of 1917 brought about a total transformation of the power structure: the end or decline of monarchy, aristocracy, priesthood, land and property ownership and the creation of a party and a one-party state, with communist ideology and state control of the economy. Russia's borders expanded and contracted, finally with the collapse of the Soviet Union. Now the Communist party gains only a small percentage in elections – 13%.

Finally the configuration of planet earth has changed with the melting of the polar ice cap. Advancing technology over the past century or so has brought air and space travel and radio wave communication. Each of these has been a feature of global power politics in 2017.

6 Formation Dynamics: Environment, Technology, Economics, Politics, Religion

Perhaps the rise and fall of nations is not what matters or at least is not the only thing that matters. Other 'formations' also rise and fall. What UK, USA, France, China and Russia share is a history in which the feudal formation of hereditary monarchy and aristocracy was violently replaced by the formation of 'modern' government. Both Putin and Xi Jinping alluded in speeches this year to the Russian revolution of 1917, the former less positively than the latter, while Trump alluded to the American War of Independence.

'Modern' government takes a variety of forms and the twentieth century saw violent confrontation between liberal democracy, socialism and fascism. The dominant USA is a liberal democracy, as is the West as a whole, whereas rapidly growing China is a socialist state. Cederman notes that the democracy index has increased over the period 1970-2015, albeit

with a recent slight decline. There is a concern that democracy is in 'recession'. A survey of 38 countries found that representative democracy was the most preferred form of government followed by direct democracy, rule by experts, rule by a strong leader with rule by the military least preferred. People are more favourable to democracy if their economy is strong and their party is in power. Inevitably different views will lead to some degree of dissatisfaction with democracy. The global economy was thought to have left some people behind, giving rise to populist dissatisfaction with the status quo. There is pressure for a shift: to the renewal of the centre (Macron in France); to the extreme right (Austria); to extreme left (Maduro in Venezuela); or to religious fundamentalism (Middle East); or to separatism, either domestic (Catalonia), regional (Brexit) or global (criticism of and threats to the UN and other global agreements).

Barack Obama's farewell speech and Donald Trump's national security plan provide a contrast between cooperative internationalism and conflictual realism.

In the era of Western dominance, western formations increased their power: capitalism, democracy, liberalism, Christianity, language and demography. Will these formations wane in the face of eastern growth? Running throughout the year there was debate about how we should regard the colonialism which was a feature of Western dominance.

The anniversary of Martin Luther and the start of the Reformation in 1517 illustrates the separatist forces in religious communities as does the contemporary fragmentation of Protestantism and Christianity in general into myriad denominations.

The 'new' formation in technology is information technology. In 2017 there was great technological advance. At the same time there were concerns: robots will take over jobs; cyberconflict will destroy social infrastructure; cyberconflict will sway democratic elections; and social media will damage social communication?

Finally global warming changes *geographical* formations such as the melting of the polar ice cap, and impacting on society.

7 Value Trajectories: Is the World Getting Better?

Are things getting better? Are people better off? Are people healthier? Is the world more peaceful? Has environmental quality improved? What of the future? What threats do people perceive?

Good things happen and bad things happen. Sometimes things improve and sometimes things get worse. So we are left with the question, are things getting better on average?

Human history thus far has been characterised by an increasing population, and technological, economic and social development.

The IMF Annual Report of 2017 reports that GDP has grown over the past seventy-six years. This growth has been uneven: GDP has grown fivefold in advanced economies and tenfold in emerging markets and developing countries. However there are concerns about productivity growth.

In *The Lancet*, *The global burden of disease* reported that mortality rates have decreased and life expectancy has increased (by 14 years) in the period 1970-2016. The rate of change has been fairly constant over the period. In the under-5 age group there were 16 million deaths in 1970 but just 4 million deaths in 2016.

National media sometimes emphasise 'our combatant deaths'. What about 'theirs'? What about non-combatants? What about other human costs besides death?

Is the world more peaceful? The research on this question has examined a wide variety of variables. A conceptualisation of variables is offered. Is the world becoming more peaceful? Pinker and others conclude from the evidence that it is, but Sarkees offers an alternative analysis and conclusion. Statistical models have a variety of possible trajectories with varying probabilities ... in particular lowest and highest, and mean, median and mode trajectories ... so there are both optimistic and pessimistic possibilities. A unit root model of war death rates exemplifies these points.

What is global warming? Does global warming exist? Are specific extreme events caused by global warming? Is it caused by human society? Is it a serious threat? Can the threat be averted? Are the proposed actions sufficient to avert it? An overview of the radiation flows between the sun, the earth's surface and atmosphere and space is presented. A recent report revises the global warming estimates used in the Paris 2015/2016 agreement and a simplified model is presented.

An international survey by the Pew Centre covering the threats perceived by people in 38 different countries. The top four threats were: IS, climate change, cyberattacks and the global economy. An analysis identified two clusters. The threats in cluster A were: US, global economy, climate, cyberattacks and China; and the threats in cluster B were: Russia, IS and refugees.

8 Knowledge Trajectories: Fermat's Last Theorem and Modularity

This chapter is about two theorems which are very easy to state but very difficult to prove. The proving of Fermat's Last Theorem (FLT) has involved a 'knowledge trajectory': a 'world society' of mathematicians working together over a period of 358 years towards a single goal – working in a spirit of collaboration mixed with individual competition, guided by the shared values of truth and beauty in mathematics. The Feit-Thompson Theorem (FTT) is not so old: its 255-page proof was produced in 1961. Associated with these two proofs, two of Britain's most celebrated mathematicians were in the news in 2017. Andrew Wiles was awarded the 2016 Abel Prize for Mathematics for his proof of Fermat's Last Theorem. Sir Michael Atiyah produced a new (possibly valid!) proof of the Feit-Thompson Theorem which was just 12 pages long.

This chapter is unable to engage with the full conceptual depths of these two theorems. Instead it seeks to understand the statements of the theorems and the associated underlying mathematical ideas, starting with the ideas in primary school mathematics - but moving fairly quickly beyond that!

We start by proving that all numbers are interesting! We then do some school mathematics, presenting some basic ideas about prime numbers and illustrating these ideas by asking 'are you in your prime?' and 'is 2017 a prime number?'. Next a discussion of right-angled triangles and Pythagoras' Theorem leads to a statement of Fermat's Last Theorem. Drawing on Simon Singh's book, certain key stages are noted on the three-centuries-long road to the proof of Fermat's Last Theorem.

Attention then turns to the Feit-Thompson Theorem. Basic ideas in group theory are introduced with special attention to subgroups and subgroup series, leading finally to the statement of the theorem.

The chapter returns to Fermat's Last Theorem and sketches the logical structure of the proof and notes the crucial role played by modularity.

How the 2017 Yearbook relates to my previous work

Yearbooks analyse contemporary world events drawing on foundational ideas in academic disciplines. Mathematical social science underpins the modelling approach which is evident throughout. These foundational

mathematical ideas are discussed in my book *Conflict, Complexity and Mathematical Social Science*³:

“This book seeks to present a foundational mathematical approach with rigorously developed, properly grounded theory ... The concept of conflict is grounded in and developed from a system of ideas relating to value. ... The topics of mathematical social science are grounded in and developed from a foundational mathematical science.”⁴

Throughout, the Yearbooks adopt an interdisciplinary approach drawing on both Humanities and Science. This relates to the very deliberate attempt to *do* Humanities and Science in my chapter *A Foundational Mathematical Account of A Specific Complex Social Reality: Conflict in A Midsummer Night's Dream*⁵, a case study of the relationship between foundational ideas and complex social reality. It also relates to my chapter *Debating the mathematical science approach to international relations*⁶.

³ Burt, Gordon. *Conflict, Complexity and Mathematical Social Science*. Bingley: Emerald, 2010.

⁴ Burt, 2010. op. cit., p. 1.

⁵ Burt, Gordon. “A Foundational Mathematical Account of A Specific Complex Social Reality: Conflict in A Midsummer Night's Dream.” In *Cooperation for a Peaceful and Sustainable World. Part 1*, edited by Bo, Chen, Manas Chatterji, and Hao Chaoyan. Bingley: Emerald, 2012.

⁶ Chapter 15 in Burt, 2010, op. cit.