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Future of command and control:

Analysis or crystal ball?

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31 ISMOR, Royal Holloway, UoL, 29 July–1 Aug 2014
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Topics

- Project Lions' Leap

- Historical view of C3

- Emerging technologies

- Conclusions

- Questions?

Project Lions' Leap

Future tactical C3

- Part of wider Army Development and Transformation
  - Dstl worked with Army HQ to think about future of C3
    - "Every good project starts in the library"
  - 2030+ timeframe
- Tactical HQ sizes and organizations
- Ways of working … not radio technology

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Study modules

- Facilitated a study day with Army HQ

- Essay on current C2 thinking (NEC, etc.)

- Historical review of C3
  - the subject of much of this paper

- Piece on possible 'disruptive technologies'
  - and how they might affect the HQ user
  - but not an exercise in predicting future ICT

Historical analysis of C3

Pre-history of warfare

- 64 species exhibit 'war-like' behaviours
  - including meerkats, dolphins and one bird
  - mostly primates, and all great apes except the bonobo*
- Most studied in chimps
- In primates it's all in a gene:
  - MAOA
  - the 'warrior gene'

*Van der Dennen (1995)

Pre-human warrior C3

- All warrior species are social

  - and all have hierarchies or 'pecking orders'

- Chimpanzees conduct sustained campaigns

  - 'total war', aiming to kill or drive off rival groups

- Some apes appear to hold 'O-groups' before a raid

- Meerkats move in column, but fight in line …

  - therefore do they 'deploy' for a battle?

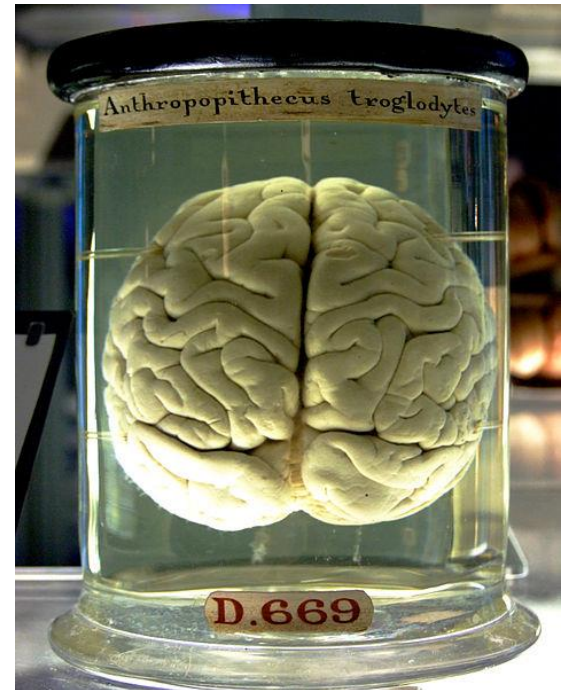- Note: not *all* species exhibit *all* behaviours

What non-human warriors do

- Chimpanzees may *use* sticks and stones
  - but not seen to modify or carry weapons
  - one amassed stones before visitors came to the zoo …
    - the start of tactical logistics?
- Basic warfare is pre-human
  - because it works, it survives …
  - co-evolved with ape brains
  - we inherit it from the apes

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30 July 2014

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Brain size and group size

- Primate group size related to neocortex volume
  - Dunbar (1992): the 'Dunbar number'
- Humans: 80–200, mean 150
  - mean numbers of friends on SNS
  - and the size of a company …
- Actually a hierarchy of groups
  - starts with 'clique' of 4 'best friends' …
  - or a fire-team?
  - some apes follow a 'rule of threes'

Anthropopithecus troglodytes

D.669

Ancient C2

- Or, "What have the Romans ever done for us?"
- Hierarchy of force, contubernium to legion
  - some 'rule of threes', some of tens …
  - an intermediate command level inserted on campaign
- Century HQ was a small team …
- Legion HQ was a 'team of teams'
  - specialist branches for personnel and pay, security, supply …
  - is anything new?

(G1)   (G2)   (G4)

Ancient communication

- Mesopotamia: as fast as a man could run …
  - and as much as a man could remember
  - then writing increased bandwidth
- Egypt: as fast as a horse could run
  - and as many papyri as a horse could carry
- Simple messages using smoke and beacons …
  - speed now limited (theoretically) to the speed of light …
  - content (bandwidth) highly constrained …
  - but did the Romans use the optical telegraph?
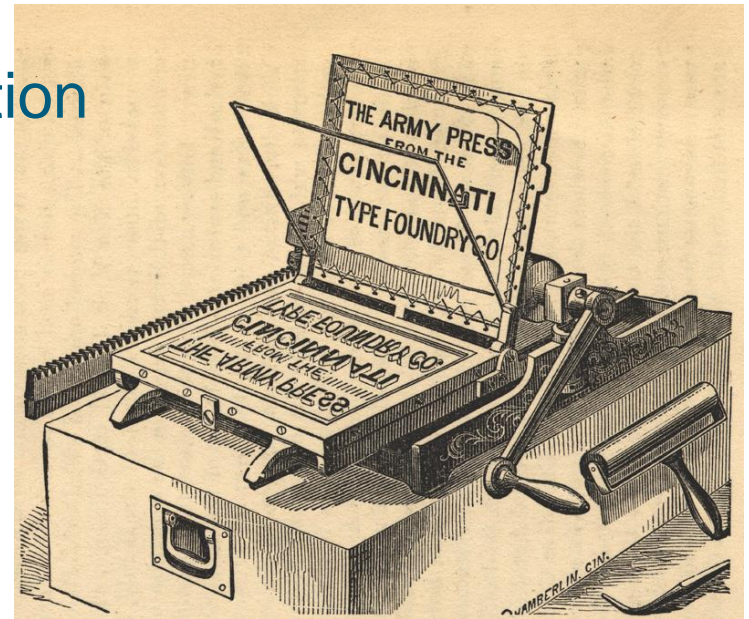
Modern communication

- Telescopes enabled effective optical telegraphy
  - England, France and Sweden, 1790s
- Electric telegraph, 1840s
  - efficient Morse code soon followed
- 1850s, Crimean War …
  - dawn of the 'long screwdriver'
- 1900s, first WT in the Boer War
  - 1914: one radio per division …
  - 2014: one radio per man!

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Military office technology

- Wax tablets drove the Roman military bureaucracy

- Paper maps from China

- Renaissance printing revolution
    - standing orders, drill books

- Industrial technology, 1800s
    - but civilians led the field

- Computers from the 1950s
    - now civilian ICT in every HQ

But does ICT buy efficiency?

- Found little evidence ICT wins battles
  - though GPS improved Coalition speed in Gulf War
  - US Stryker Brigade performance improved on exercise*
- Project explored civilian analogies …
  - again, little evidence of efficiency
  - *"You can see the computer age everywhere but in the productivity statistics"* – Robert Solow (1987)

*Gonzales *et al.*, 2005

The 'King Canute effect'

- The Army cannot hold back the ICT tide

- Needs comms with government …
    - NGOs, CIMIC, 'Green'

- All require and produce Excel, PDFs, JPGs …
    - And *everyone* expects PowerPoint briefs

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Culture – the forgotten piece

- C2 changes must be culturally acceptable
  - disaster of French combined arms regiments in 1950s
  - and US 'Pentomic divisions' in same period
- History and pride improves fighting effectiveness
- Changes that ignore culture *will* fail

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Culture – the forgotten piece

Emerging technologies

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Emerging technologies

- Human context presents challenges
  - information overload, merging of voice and data
- New sources of information
  - automated filtering, crowd sourcing, autonomous vehicles
- New ways of processing information
  - pattern and language recognition, 'big data', game theory
- New ICT aids to decision-making
- Disruptive C3 threats …

Conclusions

- HA reminds us of the roots of C3
  - not simply a modern thing …
  - but rooted in our DNA, psychology and culture
  - technology will change rapidly, but the users won't
- We must use ICT intelligently
  - to enable, not to overload
  - requires thoughtful experimentation and integration
- We ignore social and military culture at our peril!

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Questions?

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