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Research Transformed by Cyberinfrastructure:
Two Possible Scenarios for the Humanities

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3D
MODELING



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- I'm a historian...
- But I don't like that to get in the way of a good story
- Here's a story: "May you live in an interesting era."
- Whole Point: Life is not fun in interesting eras
- Ancient Chinese story gives truth to the notion that History is One Damn Thing after Another...



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- Willing to concede reasoning behind curse, not its conclusion that it applies to all people at all times
- Proposition: Humanists Live in an interesting era
- New Objects/New Platforms will enable us to express, teach and think differently
- Humanists: we don't like new things, we like old things
- Long term – scholars will find CI a blessing
- Our “interesting digital era” will force us to innovate



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•To put substance to this argument, I'll address two questions:

•How is CI changing expression and analysis?

•Why are these changes important?

•First Question: Three Developments

•Topographic Revolution

•New Platforms

•Emergence of HPC



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- **Topographic Revolution – term mirrors point made by McLuhan and Eisenstein**
- **In wake of printing press – scholars faced revolution in practice, expression and thought – the Typographic Revolution**
- **Scholars worked with Printers to solve Expressive and Practical Problems posed by the printing press**
- **Humanities scholars today face similar problem – new instruments with the following properties: topographic, dynamic and autonomous**
- **Humanists will again work with “Printers”**



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- Aside from New Instruments for Representation, Humanists will need to make peace with new “platforms”
- Platform: Repository in which communicants instantiate, store and distribute information
- Humanists can claim no measure of sophistication in dealing with emerging platforms like Virtual Worlds – no conventions, no institutions
- Find myself with need to engage in practice-oriented research to devise and test formalisms, tools and workflows



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- A final challenge: High Performance Computing
- Uncharted territory: Tera- and Peta-Scale Levels of Computing
- Emergence of *Compute Canada* and facilities like *Blue Waters* in principle makes this possible
- Our challenge: how to use this to support humanities scholarship
- Expression, Pattern Detection and Simulation



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- The future of humanities scholarship: why are these changes important?
- Best approach to answer: consider present circumstance of humanists
- Humanists use the book
- Digital Humanists concern themselves with pattern detection, and finding some explanation for its emergence and persistence



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- The importance of these challenges: the emergence of a new research domain dedicated to practical support
- Devising and testing formalisms, tools and workflows dedicated to Virtual Worlds
- Put simply: Humanities will create a counterpart to HCI
- Why? First of all we have no choice...
- We need conventions of practice and conventions for expression



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- Second: Belief that digital formalisms and platforms enrich scholarship – desire to support their appropriation by colleagues**
- Third: Belief they have strongest incentive to support needs of non-digital colleagues, and belief that same colleagues will not migrate if...**
 - They must program or...**
 - They do not have access to easy, intuitive tools**



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- These realizations are all very well – but what are we referring to when we speak of a Virtual World Platform?
- No generic set of requirements will do, but certain characteristics can be anticipated for historians
- They will simulate and express content at multiple levels of spatial organization
- They will harness X3D and XML technologies
- They will converge VWs, GIS and ABS
- Evolutionary assemblages of formalisms



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- Rationale for first characteristic: history comprised of multiple actors, from germs to multi-nationals
- Rationale for second characteristic: we need models that can change their shape, extent and surface appearance
- Rationale for third characteristic: we need city models that can express socio-economic patterns with respect to space and tools that will unearth the circumstances that gave rise to them
- Rationale for fourth characteristic: as I indicated, support for the core tasks of narrative creation



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- An understanding of characteristics of VW platforms is fine: but how will digital humanists test their solutions and workflows for creating formalisms, narratives and documentation?
- Traditionally: these tasks a part of the arts and crafts
- Recently: brought into domain of research by HCI and Cognitive Psychology
- These fields have pursued research with two fundamental aims: problem location and tool optimization



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- Much DH can learn from HCI and Cog Psy
- We won't be appropriating methods for tool optimization and statistical analysis
- Why? One: the Opportunity Cost of Statistics
- Two: Possible to develop robust formalisms and work practices without them
- Three: Extant statistical methods have been subject to severe criticism in the social science literature
- Humanists may be forgiven for viewing extant methods with caution



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- Aside from initiating a new domain of research...our three challenges will also support new lines of reasoning
- Counterfactual Reasoning: the construction of history as it might have occurred
- Historians have avoided them – it's hard enough to reconstruct the past; and our objects of concern are often too complex
- What do you do with systems comprised of heterogeneous agents numbering in the hundreds or even millions?



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- With HPC and ABS – we now have the means to study how large populations might have veered into alternate time-lines
- Two reasons why historians should do so
- First: Enable historians to determine most important cause or causes behind a given event
- Example – The Battle of Trafalgar
- Two reasons why the British may have won
- Bigger ships and Guns; or Admiral Nelson



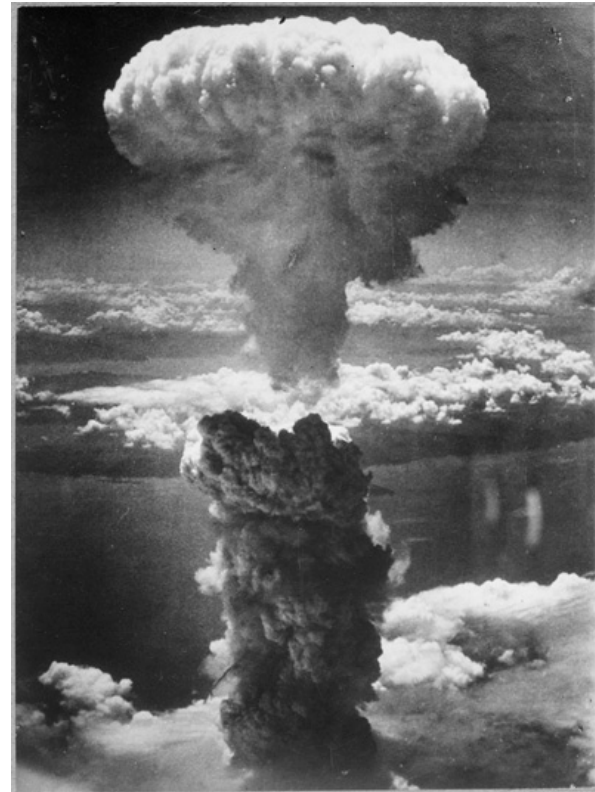
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- In 2003 Giuseppe Tratteur and Raniero Virgilio created ABS of Battle of Trafalgar
- Created simulation that replicated outcome of actual battle, and pursued several different counterfactual scenarios
- Their findings? Most important reason for victory – the size of British ships and Guns
- In counterfactuals – Britain still won, with higher losses
- Nelson's contribution – optimal strategy



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- Counterfactuals also used to ascribe significance of an event
- This particularly true when considering the use of the atomic bomb
- Issue of comparative cost: how many people would have died if the bomb had not been used?



U.S. National Archives



- Historians have had acrimonious debates attempting to answer this question
- Some cite 2 million, others hundreds of thousands
- Debate shaped by U.S. Army Estimates from the time
- This is a problem – methods used at that time to determine estimates were crude – Cases of Analogical Reasoning



General George C.
Marshall



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- Closing – Suggest through HPC and ABS are in better position to address our fundamental question: what did the bomb cost? Did it save lives?
- Question would be answered by initiating Operation Downfall
- Effort would not be trivial
 - Troop levels and Extant tactics
 - Period's Weaponry
 - Disease
 - Japan's Civilian Populace