# Workshop: Understanding Literature and Art Cultures for Transformative Research

**January 14-15, 2014**

**Center for Science and the Imagination, Arizona State University**
**National Aeronautics and Space Administration**

## Overview

This white paper represents the combined efforts of a select group of researchers to define the most promising approaches to a highly complex, multi-disciplinary problem: the relationship between literary and cultural imagination, on the one hand, and real technological innovation on the other. Over the course of two days at Arizona State University our workshop participants, which included computer scientists, physicists, engineers, computational humanists, literary scholars, authors, editors and archivists (see Appendix I for the full list) defined three interlinked approaches to this problem, which they articulated in the following problem statement.

### Problem Statement

**How can we identify and evaluate technologically innovative concepts (or "nova") in fictional narratives that are relevant to NASA's charter?**

#### The Challenge

Writers have been anticipating transformative technological breakthroughs for centuries. Jules Verne's visions of glass skyscrapers and a global Internet in *Paris au XX^e^ siècle* (1863) and H. G. Wells' rendition of modern aerial warfare in *Anticipations* (1901) are two early examples of a tradition that extends to Arthur C. Clarke's geosynchronous satellites, among many others. These authors demonstrated the power of the imagination to shape discovery, just as more recent narratives from *Star Trek* to cyberpunk have inspired generations of researchers and engineers to innovate at the boundaries of the possible.

Our workshop considered the historical facts and future potential of the feedback loop between science fiction and real-world research, exploring how ideas flow between the science fiction and technical communities. After a brief series of grounding conversations to map out key intellectual territory, we defined our problem statement and broke into three groups to address the challenge along multiple axes.

#### The Big Idea

Our driving concern in this project is to map some relevant territory in the landscape of cultural technological imagination. This is a vast space, stretching from ancient myth to *Star Wars*, but we are interested in a particular kind of idea existing in a specific context.

The kind of *idea* we are looking for is what the science fiction scholar Darko Suvin called the "novum": an innovation or transformation that achieves a form of "cognitive estrangement," fundamentally shifting our perspective of a fictional world and thereby offering a new way to see our own (Suvin, 1972). In our

workshop discussions we agreed that one novum is rarely sufficient: multiple nova function as contextual units to create compelling narrative visions of possible worlds, such as the suite of technologies (dilithium crystals, tricorders, communicators, transporters, etc) that make the *Star Trek* universe possible.

Therefor the *context* where we seek nova relevant to NASA is just as important. The workshop agreed to search for ideas that are contextually linked to real technologies (thereby eliminating far-future innovations "indistinguishable from magic", to quote Clarke). Yet relevant nova must also be sufficiently unknown or statistically distinct from real technical literature such as NASA Technology Roadmaps as to offer the possibility of new insights. In short, we are looking for nova on the edge of technical research possibility. Ideas in this category may prompt tangible research projects or cause technical communities to see existing technologies or suites of technologies in a new light.

## Paths Forward

Each group drafted a position paper defining the challenges and potential paths forward they identified in their discussions at the workshop. We see these parallel investigations as roughly contiguous with a three-phase research project:

### Phase 1: Archives and Domain Expertise

Where will the materials for analysis come from? This group discussed relevant archives of science fiction and related literature as well as the idea of assembling an expert network of writers, editors and technologists who might be able to define lists of key terms, evaluate early results and identify "high value targets" for investigation.

### Phase 2: Computational Approaches

How can we combine computational methods from Natural Language Processing and related fields with human interventions to identify thousands of potential nova across a variety of different sources? This group proposes to train a probabilistic model for identifying nova and testing it against known technical corpora, including NASA Technology Roadmap documents, as well as U.S. patent filings and abstracts of scientific articles in relevant areas.

### Phase 3: Evaluation

Once we have a list of potential nova, how can they be evaluated? This group discussed the interface between cultural visions of technology and NASA's real innovation needs, particularly in the context of its technology roadmaps. The group outlines a schema for evaluation to be used by a team of technical experts to identify ideas that may be most beneficial to NASA.

## Thrust 1: Archives and Domain Expertise

Kathryn Cramer, Melissa Conway, Matt Harp

### Define your question

How can we best create a database of science fiction works searchable by motifs/keywords/ "nova" (in addition to the usual search access points, e.g., author, title, date ) that would most interest NASA and align with NASA's technology needs and encouraging innovation?

### Key challenges

We have to build a database which contain and can be searched by all the following: context of the motif in the paragraph; sequence of works on the subject; historical timelines and historical events (W.W. II); dates of publication; relational author/publisher indices. We need to inflect our motifs to meet NASA's technological needs, which will including developing a crosswalk that will line up with NASA keywords. We need to construct searches that are open enough and broad enough to include ideas that NASA has not yet considered. We need to be able to search prose characteristics in works, including aspects like neologisms and compelling first sentences or opening paragraphs.

### Environmental Scan

Among the materials that are immediately available

Digital Resource:
Wikipedia's tagging schemes--such as emerging technology lists.
Project Gutenberg's 150 SF titles
Hal Hall's database
Lloyd Currey's database (Privately held; also material on index cards not in the online database)
Science Fiction collections that already provide motif indices (Eaton is searchable by subject headings like "Time Travel."
Motif index from Internet Science Fiction Database (ISDB)
Fragmentary databases: Archives for Locus
NY Review of Science Fiction
Online sources for plot summaries

Print Resources:
Everett F. Bleiler *Encyclopedia*

John Clute's *Encyclopedia of Science Fiction*
Neil Barron's *Anatomy of Wonder*
Lloyd Currey's database
Core sample of fanzines from certain decades (e.g., 1959 to 1989, Sputnik to the Fall of the Berlin Wall)

## Available resources and collaborators

Three stages:
a. Assemble expert informants who know the field very well--editors, encyclopediasts, scholars, SF authors, experts from NASA: Greg and John Benford; John Clute, Tom Shippey, Brian Aldiss, Graham Sleight, Kathryn Cramer, David Hartwell, Robert Silverberg, Karen Heber, Jonathan Strahan, Lloyd Currey, Rob Latham, Sherryl Vint; Eric Rabkin; George Slusser, Colin Milburn, Robert Nolton. Participants would be given honoraria depending on their level of involvement in such things as tagging

b. Using students in a class to construct a structure for selection process; how many texts and what texts would a class read. How many books--a few texts that they all read and then smaller groups of five or ten with thematic bases; ask them to identify the nova and in what context they are presented. Or hand them ten texts and ask them to identify motifs and corresponding technologies

c. Gain access to privately held databases (such as
Martin Harry Greenberg's database used to make theme anthologies)

Outcome: Define what is new, different and worthwhile in SF texts and determine how these concepts correlated with NASA technical documents, or introduce entirely new ideas.

## Paths Forward

a. Build a prototype database.
b. Create an algorithm that would search for prose characteristics--neologisms; interesting first sentence or first paragraph; known authors who have previously published good ideas; writers who are their known associates (co-authors; being in same workshops; appearing in the same anthologies; journals; published by the same publishers; unknown authors who have produced something interesting); venue of publication--mag, anthology, monograph; patterns associated of motifs associated with the author; opening paragraph or first sentence.

*Timeline*

Year One:

a. In the first year work with human resources first to construct schema from their suggestions in the first year
b. Scan a sample segment of fanzines

Year Two:
c. Test algorithm in database and refine the schema as needed.

*Shortcut deliverables*

Approach Wolfram Research, InC. and arrange to format the data in data paclet format and have them add it to Wolfram Alpha (that feeds into Siri and Bing). This will give us a prototype of the larger database. If the ASU did the data preparation for the file format for the individual data libraries. Tossing them into Wolfram Alpha puts it the orbit of scientists and engineers.

Scan the fanzines from 1959 to 1989.

Create a subgenre by what we deem is of interest to NASA.

Produce a guide for librarians on how to catalogue this material

## Thrust 2: Computational Approaches

David Bamman, Michael Simeone, Hari Sundaram, Heather Pon-Barry, Ryan Cordell, Sean Gourley, Ben Miller

### Define your question:

**In the interest of recommending areas of interest from science fiction to a group of experts for evaluation, our task is to i**dentify areas of science fiction texts that describe visionary but heretofore unrecognized technologies.

**Our research centers on features of natural language used in SF that we term "technologically suspicious:"** This term designates areas of the text that may include what Darko Suvin described as a "novum," or the general activity of "cognitive estrangement." We look for language features that index the presence of inventions and inventiveness in science fiction. We do not propose to identify with high accuracy exact moments in the texts where there is invention. We offer instead through this term a focus on specific zones that are likely to contain an invention extractable by a human reader.

### Key challenges

Feature selection for a "novum," a moment in a document where there has been some imaginative breakthrough reorders what technology or materials can accomplish, is not a straightforward task. The semantic features of a novum are not currently understood ans consistent and can vary according to context. The lingusitic structure of nova is also not thought to follow any consistent standards.

### Environmental Scan

Numerous fan groups and web sites have documented technological innovations found in science fiction, and there is a healthy ongoing conversation in literary studies that explores the relationships among science, engineering, and science fiction.

In its evaluation of text mining for scholarly applications, Jisc has published and invaluable summary of methods and pitfalls here: http://www.jisc.ac.uk/reports/value-and-benefits-of-text-mining.

We concur with this report and others that text mining can only return limited results that are often misleading. However, the results of text mining, when used as proxy data situated among deeper expertise of literature and history, has proven to be helpful for researchers in literature and culture.

To this, convincing work in text mining for literary analysis include Matthew Jockers (*Macroanalysis*), Aditi Muralidharan (WordSeer), Robert K. Nelson (*Mining the Dispatch*), Ted Underwood ("Mapping Mutable Genres in Structurally Complex Volumes"Proceedings of IEEE Big Data (2013): 18 Sep. 2013.), (Matthew Wilkens ("The Geographic Imagination of Civil War-Era American Fiction." *American Literary History* 25.4 (2013): 803-40").

Our approach adds to these ongoing efforts by exploring the viability of specific features (beyond topic models) that may identify the structure of innovative thoughts or the language that presents innovation.

## Available resources and collaborators

While there are numerous experts and resources for text mining, the most likely tools and collaborators include:

Natural Language Toolkit (NLTK): Python library for natural language processing
Mallet: Java methods for machine learning
Jigsaw: Application for text tiling by string similarities

Jana Diesner, University of Illinois at Urbana Champaign
Hasan Davaclu, Arizona State University
Matt Jockers, University of Nebraska at Lincoln

## Paths Forward

We propose a supervised learning approach that uses extant documentation of inventions in science fiction (2500 examples) as a training set for the identification of areas within science fiction texts that could be considered to be technologically suspicious. The learning algorithm would be a probabilistic model where we can rank all tested passages by the probability they contain technology to prioritize

giving them to users for analysis. e.g. logistic regression + L1 regularization[1] to remove non-informative features.

The features we identify as viable for exploration for the training of this probabilistic model:

- Words (ngrams, skip ngrams)
- first mention of words (ngrams, skip ngrams)
- number of new ngrams introduced
- relative position in book
- percentage of text in quotes
- presence of known technology terms (from dictionaries learned from pubmed, patents, etc.)
- parenthetical/appositive descriptions
- presence of statistically improbable phrase
- similarity to known technical documentation (patents etc.)
- punctuation
- weighted noun co-occurrence of technology related nouns
- word case (capitalization)
-"strangegrams" (low-probability n-grams)
- co-occurring nouns and verbs
-stylistic signals of "infodump" paragraphs

**Assessment of novelty:**

After identifying sections of science fiction containing descriptions of technologies, a method is necessary to correlate those technologies against already developed inventions and NASA technology priority areas. We propose to reference the extracted corpus against three external data sources -- the U.S. patent filings in the relevant areas, abstracts of scientific articles in the relevant areas, and NASA Technology Roadmap documents. This comparison will yield, we surmise, a sense of the classification of found descriptions relative to NASA priority research areas, and a sense of the novelty of technology descriptions. The novelty factor derives from how embedded a description is in the network of already developed technologies.

Potential Approaches to Consider alongside our proposed path forward:

**Identifying "interesting" ideas:** Assume that we have a set of science fiction texts with sections identified as possible candidates for technological ideas. Let us further

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1 Toolkits that include this learning algorithm include Weka (http://www.cs.waikato.ac.nz/ml/weka/) and python's scikit-learn (http://scikit-learn.org/stable/modules/generated/sklearn.linear_model.LogisticRegression.html)

assume that some basic clustering analysis (e.g. spectral clustering) allows us to identify a set of documents with similar meaning about the same technology.

An interesting idea is one that exists in a web of interrelated ideas, created by "interesting people" (e.g. people who comment, or other authors). If an author is represented as node, then the edge between two nodes may represent the fact that both authors have referred to the same idea. The weight of the edge would be indicative of the temporal distance between the two authors. So an idea that persists over time would be given a higher weight than otherwise. Simple centrality measures such as betweeness centrality would give us influential authors.

Conversely, we can build a graph where nodes are texts weighted by the centrality of the author, and the edges between texts represent the number of ideas that they share. Centrality measures would give us influential texts. To the set of the SF texts, we can append the set of patents, and then create edges to SF texts with which these patents share ideas. The set of SF texts that are central but are weakly connected (that is, they are one hop or two hop neighbors to texts that are connected) to the set of patents would be likely candidates to examine for ideas.

**Graphical Analysis of Invention Affinities: One potentially useful approach to understanding documented inventions as well as future lists of inventions would be an analysis of topic x topic correlations among invention descriptions. Through the use of overlapping schemes of organization it would be possible to reveal latent vs. explicit ways to group the inventions. This approach would help shed new light on the interpretation of inventions; a technology thought of as a communications technology may share an affinity with space travel technology that is worth exploration by experts. An example of this approach for genre classifications: http://isda.ncsa.illinois.edu/~mpsimeon/topics/FDE/indexvml.html**

## Thrust 3: Evaluating Nova

Colin Milburn, Ron Broglio, Peter Goggin, John Cramer, Bruce Clarke

### Defining the question

Taking the input from the processes set up to identify an appropriate corpus to which computational operations have been applied, we must now address the ontology of the novum. We need ways to decide which nova are most promising to present to NASA groups for possible action. The evaluation process must first decide the nature of the novum: does it emphasize technological or sociological innovation, or both? Does it pose new questions, or new solutions? Are the solutions likely to be feasible? Are there opportunities for public investment? The evaluation process must be adaptive to future situations, later evaluations. Given different potential advances, it should offer steps that are reusable in different contexts. Additionally, how do we access cultural and institutional memory to reclaim ideas and plans that have been previously overlooked or rejected, but aspects of which may have new viability?

### Key challenges

We can see a number of key challenges presented by the evaluation process. Can historical precedents for evaluative work be identified? How do the texts themselves make the possibilities of the novum real, material, and tangible? Concerning the effort required per evaluation: how many human-hours of work at what expertise level is required to do a meaningful evaluation? Is this consistent with the number of evaluations to be done and the resources available? What will be the best way to tie identified nova to existing NASA projects and to NASA's National Space Policy? What are the paths for evaluating these different dimensions of the nova and the potential for translating it from a fictional innovation context to an actual innovation? To what extent will science-fictional sources need to be legitimized for NASA reception?

### Environmental scan

Many of the best known instances of science fiction becoming a resource for innovation are anecdotal in nature. However, several studies have examined particular cases where science fiction texts and speculative scenarios have contributed to actual technical research. These studies have used qualitative historiographic and cultural analysis approaches to understand the biographical, literary, and sociological factors involved in the uptake of speculative fictions into particular technical contexts. Such studies include: Mark L. Brake and Neil Hook, *Different Engines: How Science Drives Fiction and Fiction Drives Science* (Macmillan, 2008); John Canaday, *The Nuclear Muse: Literature, Physics, and the First Atomic Bombs* (University of Wisconsin Press, 2000); H. Bruce Franklin, *War Stars: The Superweapon and the American Imagination* (Oxford

University Press, 1988); De Witt Douglas Kilgore, *Astrofuturism: Science, Race, and Visions of Utopia in Space* (University of Pennsylvania Press, 2003); David Kirby, *Lab Coats in Hollywood: Science, Scientists, and Cinema* (MIT, 2010); Howard E. McCurdy, *Space and the American Imagination* (2nd ed., Johns Hopkins University Press, 2011); and Colin Milburn, *Nanovision: Engineering the Future* (Duke University Press, 2008).

Several pop-nonfiction books have assessed technologies that have some connection to science fiction visions, even if the specific causal relationships may be underdeveloped. For example: Robert W. Bly, *The Science in Science Fiction: Eighty-three SF Predictions That Became Scientific Reality* (BenBella, 2005); Thomas M. Disch, *The Dreams Our Stuff Is Made Of: How Science Fiction Conquered the World* (Simon & Schuster, 1998); Nick Sagan, *You Call This the Future?* (Chicago Review Press, 2007); and William Shatner and Chip Walter, *I'm Working on That*: *A Trek from Science Fiction to Science Fact* (Pocket, 2002).

There is also a genre of pop-science writing that attempts to assess popular media franchises as repositories of future technologies, speculating on the technical or scientific content that might make sense of otherwise implausible or impossible plot elements. For example: Lawrence Maxwell Krauss, *The Physics of Star Trek* (HarperCollins, 1996); Roger Highfield, *The Science of Harry Potter: How Magic Really Works* (Viking, 2002); and Anne Simon, *The Real Science Behind the X-Files: Microbes, Meteorites, and Mutants* (Simon & Schuster, 1999).

None of these earlier studies or popular texts, however, has attempted to systematically identify the qualities of particular fictive concepts that afford translation into actual technical contexts, nor have they established evaluative procedures for addressing the feasibility, desirability, and implementability of particular science fiction nova.

## Paths Forward

Evaluation of the various nova will need to assess not only technical plausibility—whether as presented in their original fictional context or through possible workarounds or supplements—but also desirability, implementability, and long-term benefits as well as risks. Nova will then need additional organization into subject areas such as scientific or technological fields. To assist the task of prioritizing nova, another dimension of evaluation will be to poll reactions among specialized interest groups, such as fans and science fiction scholars, and to explore opportunities to conduct evaluation processes through intermediary organization, crowdsources and expert communities.

A team of experts will carry out a set of evaluation procedures:

- Assess the ontology of the novum (is it a problem or a solution? What is its scientific or technical field of relevance?)

- Assess how the novum is evaluated within the context of the fictional text in which it originally appears (plot outcomes, character reactions, narrational tone, and so forth).
- Assess how the novum is evaluated in the context of its public reception, the ways in which readers, critics, and fans respond to it during the time period in which the text was first published. Was the novum perceived as exciting, innovative, and feasible? Why or why not?
- Assess how the novum is evaluated over time, the ways that audiences continue to remember, discuss, and analyse the novum in the years or decades after its original publication. Does the novum have staying power? Why or why not?
- Assess the novum's potential for futurecasting, scenario construction, and public-engagement exercises (e.g. "anticipatory governance" methodologies for evaluating public responses and anticipating levels of public support).

Results will be presented to NASA to consider for near-term or future development and implementation, relative to existing and future NASA areas of interest.

## Available resources and potential collaborators

Science Fiction Research Association (SFRA)
Society for Literature, Science, and the Arts (SLSA)
UC Davis Humanities Innovation Lab
Panel discussions at selected science fiction conventions ( e.g., ReaderCon in Boston, Emerge @ ASU) to present the program and elicit help from selected segments of the science fiction community.

## Appendix I: Participants

- David Bamman, PhD Student, Language Technologies Institute, School of Computer Science, Carnegie Mellon University, dbamman@cs.cmu.edu
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## Appendix II: Inspirational Questions

Kathryn Cramer

Illustrated question space (click for high resolution image):

TKTKTKTK

1. How do we invent an alphabet of ideas?

2. How do we expand existing SF motif indexes to cover SF topics of the past 30 years?

3. How do we recognize what new questions SF is asking for the genre as a whole?

4. How do we teach engineers to research prior art in the SF literature and its media?

5. How can we track the evolution of ideas and motifs within SF?

6. How can we influence SF writers as a group to occupy themselves with topics of interest to NASA?

7. How can we better use SF as a lense to address problems NASA has identified?

8. How can we better use SF and the SF field to engender support for NASA's projects?

9. How do we identify the best new ideas within recent SF?

10. How to we best elaborate on Hieroglyph's encouragement of SF writers to work on solutions to the world's problems?

11. How do we use SF to find out what the worlds' problems are?

12. Is it more productive to focus on the ideas of the best SF writers, or the cast the widest possible net to extract ideas from SF as a whole?

13. How useful is it to extract ideas from SF's various bodies of fan fiction?

14. How do we identify unique and new science fictional ideas in their sentence and phrase level manifestations?

15. How do we identify ideas that propose new problems?

16. How could the ISFDB be used as a basis to catalog new and evolving SF ideas?

17. How can we find the right metaphors to understand the progression of ideas in SF?

18. How do we mesh the body of ideas in print science fiction with ideas to be found in other media such as films or patents?

19. How to we compare the emerging body of ideas in SF with the emerging body of ideas in the patent, scientific, and engineering literature?

20. Are ideas in science fiction more like a particle or a wave?

21. How can we distinguish writers who generate new ideas from writers who popularize existing ideas?

22. How can we distinguish writers' ideas from ideas generated by editors and/or publishing lines?

23. Does the humanizing of an idea by placing it in a narrative populated by engaging characters improve ideational quality or does it merely enhance our ability to pay attention to the idea?

24. How can we tell what SF authors are making up and what they are taking from life and the state of the world as it is now?

25. How can ideas in SF best be harnassed to make money?

26. If SF authors, scientist, engineers, universities, governmental agencies, and companies are to work more closely together to use SF as an engine for innovation, how are the fruits of the resulting intellectual property to be distributed?

27. Who should be expected to be paid for their ideas and who should expect to give ideas away for free?

28. How do we distinguish good ideas from bad ones?

29. How do we distinguish ideas that would advance the cause of social justice from ideas that would intensify inequality and repression?

30. How do we search for ideas in non-English language SF? How do we identify what ideas in such literatures are derivative from English language SF and what

ideas are new and different? How do we address the spin each national literature gives specific ideas?

31. Are ideas propagated by big budget movies part of the signal we are looking for or are they noise?

32. How do we understand science fictional concepts with unstable definitions (for example, space opera)? How do we distinguish terms with unstable definitions from more commonly understood terms?

33. How do we square the virtues of Gertzian thick description of ideas and concepts with large scale harvesting of ideas? Is an idea still the same idea when extracted from a large body of texts as when articulated and elaborated by an individual writer?

34. How do we know whether ideas that go viral are better than others that don't?

35. How do we identify great ideas that otherwise will go unattended?

36. How do we identify ideas that are ahead of their time?

37. How do we tell when it's "typewriter time"?

38. How do we make the best use of existing SF archives?

39. How do we make the best use of SFs core of knowledgeable bibliographers, encyclopedists, anthologists, and critics? Given that many of these people are at or beyond retirement age, how do we make the best use of them in a short time frame?

40. What is the best delivery system for ideational content extracted from SF if our goalis to spur innovation?

41. How do we put the right SF ideas under the noses of scientists and engineers when they need it most?

42. How do we get scientists and engineers to pay attention to ideas derived from science fiction if they themselves are not already interested in SF?

43. How do we make an idea's association with science fiction a plus rather than a minus for governmental agencies and other decision makers?

44. How do we identify the importance and meaning of "strange attractor" books, stories, authors, and movies?

45. What underlying processes in SF generate the best ideas and how do we enhance them?

46. What applications of money to SF will generate the highest ideational yield?

47. How do we distinguish SF ideas that merely sound convincing from ideas that would really work?

48. What would be the impact of the creation of new awards in the science fiction field targeting innovation?

49. What would be the impact of a new original anthology series targeting innovation?

50. What would be the impact of a new reprint anthology series targeting innovation?

51. What would be the impact of expanding CSI's program of providing scientific and engineering support to working SF writers?

52. How do we gain access to and best make use of archives of "metadata" about SF?

53. What would be the impact of teaching scientists and engineers to think like a science fiction anthologist? Could courses be designed to teach them how to do SF "case books" for topics in which they plan to undertake research?

54. Is targeted exploration of specific topics the best way to make use of SF's metadata?

55. Would the creation of new forms of SF, for example SF that doesn't take out the math or that footnotes it's sources, advance the cause of of innovation?

56. Could one crowdsource the tagging of SF ideas using the ISFDB?

57. Can the emerging writerly tactics of Hieroglyph be extracted? Would having a conference involving the writers in the book be a good way to do that? If such methodology were to be extracted, who would it be most beneficial to teach it to? Established working writers? Creative writing students? Science and engineering students? Working scientists and engineers? All of the above?

58. Is there a linguistics of ideation that can be extracted from SF? Could that be taught?

59. Would using Wikipedia's list of emerging technologies be a useful way to expand on Blieler's list of motifs in SF?

60. What kinds of SF ideas increase empathy?

61. What kind of SF ideas help build a consensus for innovation?

62. What would be the best kinds of innovation for SF to advance?

63. How can emerging ideas best be sheltered from the glaring light of "been there, done that" attitudes?

64. Is there anything new under the sun? Do "new" ideas actually exist?

65. How do we construct a history for "new" ideas? Would that be productive?

66. Would Wolfram Alpha and the data libraries for Mathematica be a good delivery system for innovation-oriented ideas extracted from SF? Would it be a good platform to point scientists and engineers towards works of SF that might advance ideas they are researching? (Wolfram Alpha also feeds into Siri and Bing, I think.)

67. What areas of innovation are not being covered by SF writers but should be? Would it be productive to commission SF writers to explore those topics?

68. In thought experiments, does it matter who the Beobachter (observer) is? Does characterization in SF enhance the ideational content?

69. Are innovative ideas better explored in SF short stories or in novels?

70. How do we evaluate the quality of ideation in SF novels and stories? In SF movies and TV shows? What is a unit of quality of ideation? How could that be measured?

71. How can quality of ideation be distinguished from influence?

72. How can fashions be distinguished from paradigm shifts?

73. What role does literary style play in SF ideation? Are the ideational qualities of a text easily separable from the stylistic ones?

74. Would it be useful to examine the role of literary style in the ideation of certain writers such as Gene Wolfe, Ursula Le Guin, Bruce Sterling, Samuel R. Delany? Are there certain stylistic characteristics of texts rich in high-quality ideation?

75. How important is an SF writer's academic and professional background to the quality of ideation in his or her works? Would it be useful to incorporate these factors in evaluating large textual data sets?

76. Are there typologies or ways of thinking that can be identified among subsets of SF writers? Do these break along sub genre lines or differently?

77. How useful would Facebook-based social network analysis of the SF field be to answering questions about the quality of ideation?

78. Why can't SF writers just tell you their best ideas? What is it about these ideas that makes them need stories and novels to inhabit? How can we distinguish between ideas that need novels and those that don't?

79. Do novels make ideas better?

80. How do ideas benefit from plots? (Do they benefit from plots?)

81. What kinds ideas are better served by the more visceral medium of film? What kinds are better served by novels? What kinds of ideas cannot be properly served by either? (example: mathematical proofs)

82. Is there something that could be done to fiction to make it a better vessel for a wider range of innovative ideas?

83. How do demographics figure into ideation in fiction? How does that play out in terms of ideas associated with age cohorts and other groups?

84. Does SF have the power to get people to Mars? If it does, what would it take to leverage SF to do that?

85. What are other things SF might be leveraged to accomplish? Which are the most worth doing?

86. Is happy SF more idea-rich than bleaker SF? Does this track to the metaphor of depression in individuals, or is that a false analogy?

87. Do dystopias have the power to inspire? Or is positive visualization a necessary element of innovative ideation?

88. Are happy people smarter? Does having good ideas make you a happier person? Does this scale?

89. What role does literary point of view play in the ideational quality of a text? If Utopias and Dystopias are in large part a matter of point of view, how can choices about point of view affect ideational quality?

90. Is there anything about sentence structure in SF that characterizes high quality ideation?

91. How do we capture long wavelength ideas in SF, which is to say ideas developed over a series of books or perhaps over the course of an authors' entire career? Are these of more interest or less interest than ideas of shorter wavelength?

92. How does nationalism figure into our evaluation of the qualities of a good idea? Should it? Is an idea that advances a national agenda better than an idea that advances another kind of agenda?

93. Should agendas be distinguished from ideas? Should ideas be grouped by agenda?

94. Should ideas be grouped by scientific discipline or is it better to view science fictional ideas as inherently interdisciplinary?

95. Are some ideas inherently evil? How do we sift out evil ideas?

96. Are there some ideas that need to be articulated even if they would be terrible in practice? (Example: Is it worth discussing whether Neal Stephenson's tall tower should be built on the top of Mt. Everest?) Are there some ideas that should not be discussed because someone might do it? If so, how do we sift them out?

97. Are ideas that appeal to power structures better or worse than ideas that appeal to individuals or masses of people? What are the characteristics of each? How can they be sifted?

98. How do questions of ethnic and gender diversity figure into harvesting of ideas? Should care be taken to assure diversity of ideational sources and voices?

99. Do different kinds of SF writers represent different kinds of ideational stake holders? What are the implications of that?

100. Will authors like what is done with their ideas? Does whether or not they like it matter?