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Redesigning the Engineering Mind:
The Revelations of the Arcturus IV Science Fiction Project at Mid-century MIT

Katherine Pandora
University of Oklahoma

After the United States passed the midpoint of the twentieth century, a small group of earthlings learned that they should not think of themselves as being alone in the universe, for sub-human life also existed on the fourth planet out from the great Northern star Arcturus, which exists some three dozen light-years out from our planet. The inhabitants of Arcturus IV possessed a number of intriguing characteristics, "having evolved from birds instead of mammals, [they were] built rather like gigantic 'King Penguins,'" with hollow bones filled with hydrogen or helium, long arms. . . tipped with two clawlike fingers," and, in addition to "two highly sensitive eyes that can see infrared and ultraviolet as well as ordinary light," the extra-terrestrials each possessed a third eye in the middle of their foreheads that provided X-ray vision. Arcturus's huge mass generated a gravitational pull eleven times that of the Earth, cycled through days of 159 hours, and was immersed in an atmosphere primarily composed of methane. The Methanians' largest city, Snafu, contained 15,500,000 individuals, and their civilization was fueled by atomic power plants, although oddly enough they knew "nothing of electronics." Reports from explorers described their civilization as the kind of "somewhat backward culture" that one would have found circa 1905 in the United States. As it turned out, Arcturan civilization had a message for the earthlings, although it was not a religious, or a political, or a cosmic one: they instead existed to teach a handful of wary engineering students at MIT lessons in "creative engineering."[1]

The brainchild of John E. Arnold, associate professor of mechanical engineering, this experiment in appropriating science fiction for teaching purposes lasted about five years, generating strong feelings both pro and con along the way. Arcturus would fade from the MIT cosmos by 1957, when Arnold decamped for Stanford University, where his tenure would be short due to his death in 1963 at age 50. A few remnants of the Arcturan Project remain: an admiring article in 1952 from *Popular Science* as the project entered its second year; a nod of approval from the King of Science Fiction himself, John W. Campbell, Jr., whose influential magazine, *Astounding Science Fiction*, featured Arnold's fullest public statement of his pedagogical aims and practices in an article written for the May 1953 issue; a lavish spread in *Life* magazine in 1955; and at least one of the elaborate project case books that Arnold created, replete with written communications from the year 2951, on letterhead from the Massachusetts Intergalactic Traders, Inc. (MIT) and the Terran Exporting Counsel Headquarters (TECH), reports from the physiological, psychological, production design, and marketing departments, drawings of student designs and more – testifying to the elaborate planning that went into what was but one three-to-four-week segment of a single semester-long course in creative engineering.[2]

Arnold was an MIT grad himself, having completed a master's thesis in mechanical engineering in 1940. Its prosaic title, "Factors Influencing the Machining of Metals," didn't hint of an iconoclastic bent, but perhaps the fact of his undergraduate preparation did: he had been a psychology major at the University of Minnesota with a strong interest in literature as well.[3] Graduating in 1934 with dim prospects for work as a psychologist in the midst of the Great Depression, he eventually found employment as a night watchman at an oil plant, and whiled away part of the wee, small hours reading through the technical reports on the President's desk. Becoming intrigued with engineering, Arnold pursued other technical avenues, eventually becoming an assistant designer at a small company making industrial machinery. Encouraged by his experiences, he applied to MIT, where he completed "a five-year course in three years . . . and emerged as a properly qualified mechanical engineer."[4]

In 1942, MIT hired Arnold as an assistant professor of mechanical engineering, with responsibility for courses in machine and product design. The curriculum he had inherited (and was presumably trained under) was filled with problem sets "in which all the conditions were specified and to which there could be but one correct answer." Dissatisfied, he went in search of more challenging fare. According to an interview of Arnold, "while wondering how on earth to strip a problem of all preconceptions, habits and attitudes, he suddenly thought, 'Why 'on earth' at

all – why not elsewhere?' He needed a planet all his own, and he thereupon created Arcturus IV out of the void." The science fiction experiment was the lead case study for the semester. After completing it, students went on to more conventional but still interesting projects such as "designing a Chinese typewriter with 4,000 or more characters . . . reconsidering the hospital bed and its functions, looking for new methods of food production in Burma, and . . . mining below the Antarctic icecap."[5]

With the Arcturus unit of the creative engineering class serving as the flagship offering for a suite of courses over four years intended to use outer space to launch engineering students into an exploration of their own inner space, *Life* magazine informed its readers that Arnold had retooled the design program into "one of the most exciting experiments in pedagogy in the country." Perhaps too exciting, for some: *Life* reported that "Arnold's seemingly farfetched methods have made him suspect in the eyes of some academic colleagues and some of the engineering profession," for he had "schock[ed]" traditionalists and "agitat[ed] conservative leaders." Perhaps even worse for his institutional reputation, he was "regularly accused of theatricalism and publicity-seeking," the criticism coming down particularly acutely when Arnold published his account of Arcturus in *Astounding Science Fiction*.[6] More recently, Fred Hapgood, in his breezy history of MIT, *Up the Infinite Corridor: MIT and the Technical Imagination*, allowed that Arnold's innovations were "a brilliant save," shaking up as they did the previously stodgy aspects of the product design program by infusing it with "the futuristic spirit of the engineering sciences." Nevertheless, he finds Arnold's efforts to be nothing more than a sideshow, stating that the "extraterrestrial applications" gave the curriculum a "strange taste," and leaves standing without comment the evaluation that "not all the members of the faculty felt completely comfortable training their undergraduates to, as they saw it, illustrate the covers of science fiction magazines."[7]

The juxtaposition of the lowbrow reputation of science fiction with the elite reputation of the Institute as it entered the 1950s no doubt had something to do with both the uneasiness engendered by Arnold's innovations for some, and for the fascination felt by others. There is more to this debate, however, and perhaps it is best to start at the most basic level and to ask: Why did a course innovation which totaled only a few weeks out of an academic year generate such intense responses? Could grown men really have believed that the effort to bring into being such extraterrestrial product prototypes as Methanian baby-strollers, toasters, vehicles, and lawn care tools really warranted either such lavish praise or scorn? What was at stake in the Arcturan debate?

One key point at stake in this experiment was Arnold's belief that every person possessed the capacity to be creative, not simply a small number of exceptional individuals, and that higher education was under an obligation to foster creative thinking. To demonstrate the viability of this assertion, Arnold turned to science fiction first to create a social psychological environment that would encourage students to be independent learners, rather than passive recipients of information. The use of science fiction next facilitated the deployment of cognitive strategies that favored divergent thinking (generating a spectrum of many possible answers) over convergent thinking (searching for one correct solution). By rewarding moves toward independent, speculative thinking, Arnold thus bet that his students would generate creative mind-sets that would unsettle the mid-century status quo. Why not imagine alternate worlds?

To begin then, one striking aspect of the social psychological dimension of Arnold's use of science fiction is the fact that it tended to unsettle the conventional hierarchical aspects of teaching, with the instructor as the unquestioned expert in possession of the right answers, and students as the neophyte recipients of correct method. If Arcturus was Arnold's own universe, it was one embedded within the wider galaxy of the students' experiences as science fiction fans. Former student Austin Baer, for example, recalls that "in the fifties, science fiction was a very important part of every campus bookstore's offerings. Isaac Asimov, Ray Bradbury, et al were tops on most M.I.T. students' reading lists." Arnold himself noted that "a great many of the students with imagination are already science-fiction fans or else take to it very readily."[8]

The leveling effect of using science fiction encouraged the students to take on leadership roles in relation to their lab work. Arnold insisted that "the future of the program is limited only by the imagination of those participating in it, and this includes students as well as instructors. . . [the students] are encouraged to enter into its formulation

CONFIDENTIAL REPORT

Terran Exporting Counsel Headquarters

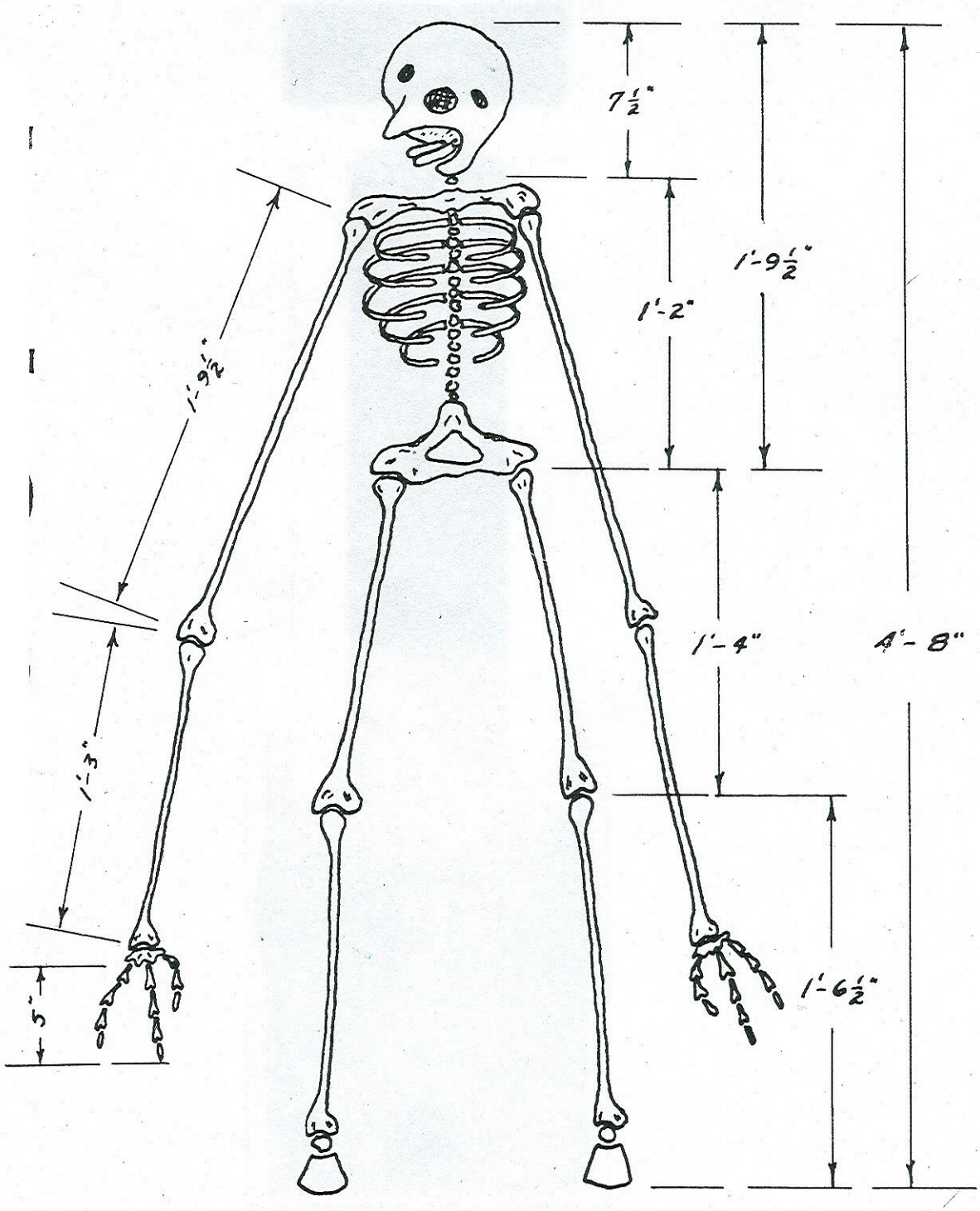
DATE 14 MAR 2951

FROM GARE E. TOFF

TO K. WAD LEE - T.E.C.H.

SUBJECT METHANIAN MALE

FILE NO. 3463



SUB-HUMAN TYPE # 1046-A

ARCTURUS IV

which they freely do." There were numerous ways in which this was the case, the first being the involvement of MIT's Science Fiction Society, whose members helped to mold the course; another was the upperclassman Baer, who Arnold arranged to have teach some of the courses in the creative engineering sequence while still an undergraduate. Students injected changes into Arnold's directives, as when he assigned the task of designing a machine that would increase the effectiveness of harvesting food crops. Having mentioned in passing that one of the Methanians' problems with crop yield was a troublesome rodent, some students decided to tackle the problem of rodent elimination instead (which led to their need to flesh out the creature's characteristics – which they christened the "tartibbar" – and a scientific report on its physiology and habits for starters.) Of such incidents, Arnold was reported as cheerfully responding that: "I've lost control, . . .The planet has a life of its own now."[9]

Moving now to the cognitive psychological aspects of Arnold's curriculum, the basic rationale for the elaborate science fiction framework was that "when a student starts the Arcturus project, he enters a whole new world where it is useless to try to copy the conventional and accepted. He must use his imagination and think creatively whether he wants to or not – or he won't solve his problems."[10] The hope was that using this kind of disorienting framework right off the bat would shake up a student's preconceived ideas not only about conventional problem-solving methods, but also about his own capacity for creative thinking. Writer Morton Hunt, in the *Life* magazine piece, explained that "since there is no such thing as a 'correct' answer to any design problem on Arcturus IV, Arnold's students get a chance to think freely toward goals of their own choosing."[11] In Arnold's own words, grappling with the Methanians delivered "a very stimulating jolt to the imagination . . . ,The big adjustment demanded by the Arcturus case makes the subsequent adjustments relatively easy. [A student] has to stretch his imagination to such a limit that it doesn't quickly shrink back to its former inconspicuous self."[12]

The elaborate casebook and other touches (props such as "telegrams . . . posted on the [classroom] walls to describe urgently needed devices, products and tools for the Methanian bird-people . . . a bird 'hand,' shipped from Arcturus in a small coffin-like crate for post-mortem on Earth," and so forth)[13] were meant to immerse the students in a cognitive environment where divergent thinking strategies were necessary correlates. If this attempt at sustaining a weeks-long brainstorming session looked something like encouraging students to daydream in class, that would not be a wildly-off-the-mark evaluation. In discussing this issue with *Popular Science* writer Hartley Howe, Arnold in fact spoke in positive terms about the uses "of day-dreaming, or of speculative thinking." All too many contemporary scientists, Arnold held, "don't care to speculate; they leave that to the science fiction writers." In an unpublished piece entitled "Cultural Blocks on Creativity" from 1956, Arnold took up the seemingly

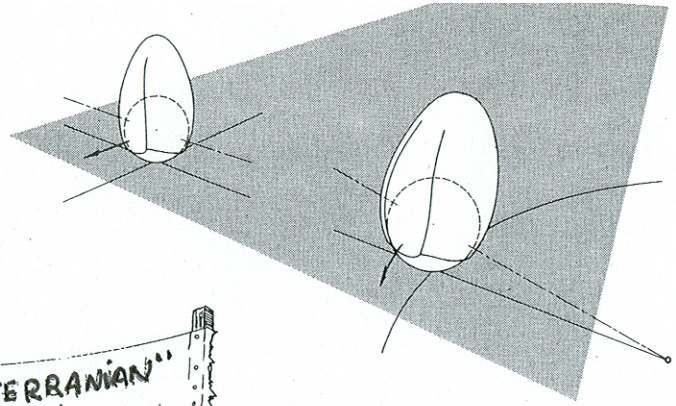
> 'childish' trait . . . of imagining or fantasy.
>
> This talent is basic to the creative personality and is present to a large degree in most children. Yet too many of us look upon the fantasies of children as *idle* play and one of the childish things that must be put away when one becomes a man. Daydreaming is accepted in the very young and the very old and tolerated in the genius, but the rest of us better stick to active work if we are to be accepted as 'normal' people.[14]

An eye-catching example of this divergent thinking process emerged from Arnold's challenge to the students to bring "powered transportation . . . to [this] primitive culture that had never used anything but foot-power and domestic animals."[15] The winning solution turned out to be "conservative in conception, [yet] totally unorthodox in design." Working from the fact that Methanians are born in eggs, Austin Baer designed an "eggomobile" that would accommodate the Methanians' exceedingly long arms and legs, and give the hitherto transportation-less creatures a sense of psychological security in "returning to the egg" as they sped around the planet (well, relatively speaking, at 8 m.p.h.). The ovoid machine's equilibrium would be "maintained by balancing counterweights in the bottom of it," and it would move "by means of a large rotating sphere containing a motor at the bottom of the egg. The single wheel would minimize friction while the egg shape would minimize the effect of collision."[16] The eggomobile was an aesthetic, emotional, and mechanical example of the techno-logical imagination in action, the result of allowing for a creative play of ideas.

Arnold's goal was to restore that which had, he argued, naturally existed within each individual in their childhood: "the capacity for almost endless

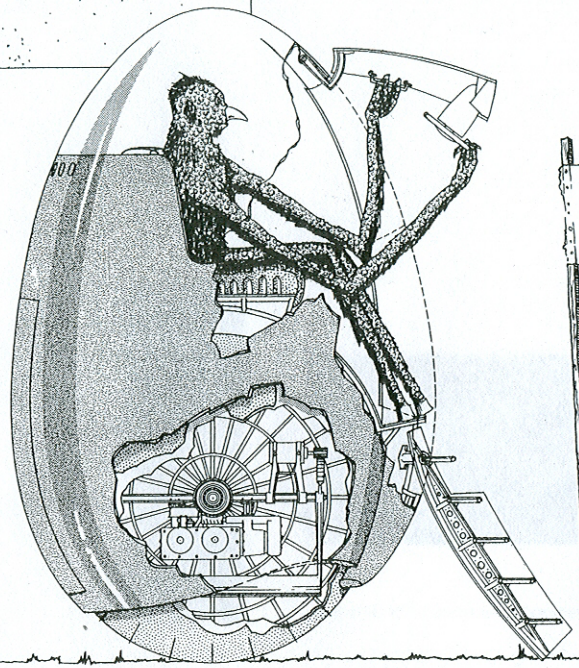
BAER DESIGN STUDIOS

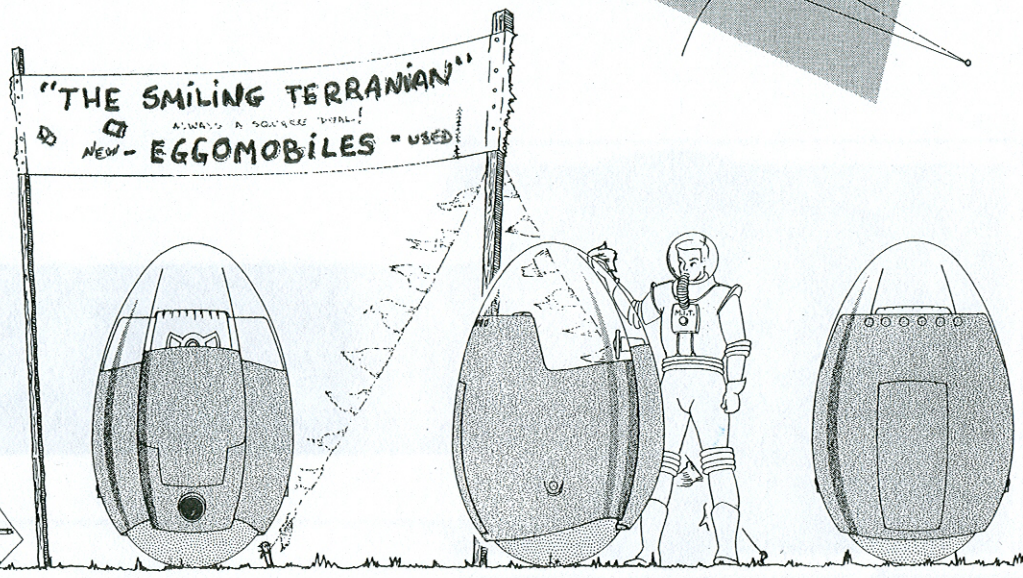
"EGGOMOBILE"



SALES FEATURES

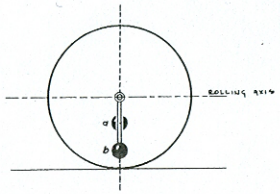
- MAXIMUM SPEED: 8 M.P.H. +
- ENGINE: 4 CYLINDER OPPOSED.
- HIGH SEAT POSITION - GIVES MAXIMUM RANGE OF VISION.
- INFRA-RED HEADLIGHT - LOW POSITION FOR FOG SERVICE
- ELECTRIC SERVO-STEERING
- SHORT STEP-RISER HEIGHT.
- TREADS LINKED TO FOLD UP AS ENTRY LADDER IS RAISED
- ALL HATCHES COUNTERBALANCED
- LUGGAGE SPACE IN REAR.
- BALLAST WEIGHTS ADJUST VERTICAL "TRIM" FOR BAGGAGE.
- SEGMENTED SPHERE FOR EASE OF MAINTENANCE.
- ALUMINUM FRAME USED.
- AIRPLANE-TYPE CONSTRUCTION
- SILICONE-RUBBER FOAM SEAT.
- SAFETY-COATED METHYL-METHACRYLATE WINDSHIELD
- SHELL: STRIATED ALUMINUM.
- SILICONE-RUBBER BONDED TO CLEATS FOR AMPHIBIOUS OPERATION, GROMMETED TO THICKER RUBBER SPHERE
- EXCELLENT COLLISION RESISTANCE
- PSYCHOLOGICAL SECURITY.



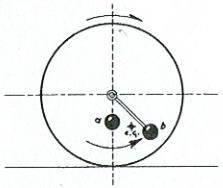


AUSTIN R. BAER 10-28-52

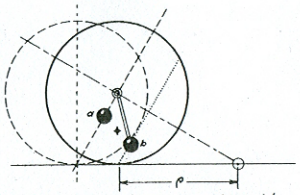
WEIGHT DISTRIBUTION, STEERING, AND STABILITY..... FRONT VIEW SHOWN IN EACH CASE.



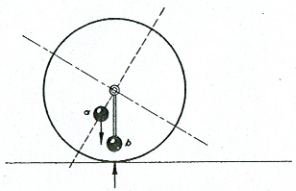
- WEIGHT "a" FIXED RELATIVE TO AXIS OF SPHERE.
- WEIGHT "b" SUSPENDED AS STEERING PENDULUM.
- CENTER OF GRAVITY LIES BETWEEN WEIGHTS.



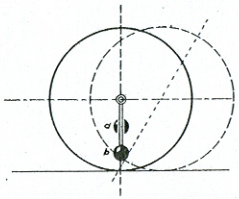
- MOMENT IS APPLIED TO PENDULUM.
- CENTER OF GRAVITY SHIFTED TO RIGHT.
- SPHERE STARTS TO ROLL TO RIGHT.



- POINT OF CONTACT AGAIN LIES UNDER C.G.
- ρ INDICATES RADIUS OF TURNING CIRCLE.
- TURNING CIRCLE ~ DISPLACEMENT OF PENDULUM



- PENDULUM IS RELEASED, SWINGS TO VERTICAL.
- CENTER OF GRAVITY MOVES TO LEFT.
- THIS SIMULATES RELEASE OF STEERING WHEEL.



- SPHERE RETURNS TO VERTICAL.
- MOTION RESUMES STRAIGHT PATH.
- "EGGOMOBILE" IN STABLE EQUILIBRIUM.

questioning." The turn to science fiction was meant to model a belief in the power of "what if?" thinking, an ordinary feature of human thought that was destroyed by teaching methods in high school and college

> We like to believe that we are teaching our students to think when all we are doing is stuffing them full of facts and processes, answers to questions that they are not yet motivated to ask or have had no chance to ask. A great majority of our time . . . is spent in teaching the old answers (the ones we know) to old questions on one day and then grading these answers as they are returned to us in examinations. We act as if there were but two steps or aspects of the cognitive process, taking in information and retaining it for a short period.[17]

In arranging visits to Arcturus once yearly for the students opting for the Creative Engineering courses, Arnold's educational practices struck a nerve, for they violated conventions that gave pride of place to well-established norms regarding convergent thinking. But there were larger implications as well, for the issue of creativity was on Arnold's mind not simply as a way to encourage more flexible thinking as a generally positive matter, but because he saw it as an essential bulwark against an increasing propensity towards conformity within the larger society. In "Cultural Blocks on Creativity," Arnold spoke of the fact that "it is the almost overwhelming pressure to conform to an established pattern, a right answer in effect that prevents a great many potentially capable creative individuals from realizing to any degree the abilities they possess. This is pressure which [David] Riesman says leads to 'other-directed' rather than 'inner-directed' people."[18] The experiments that Arnold initiated at MIT were contemporaneous with the appearance of Riesman's *The Lonely Crowd* in 1950 and ended around the time that William H. Whyte's *The Organization Man* was published in 1956 (at which time he would enter a new phase of his career at Stanford with a joint appointment as a Professor of Mechanical Engineering and a Professor of Business Administration). In the Creative Engineering Laboratory, Arnold was seeking to brainstorm answers to the kinds of challenges being raised by critics such as Riesman and Whyte, using MIT as a miniature model for the larger society. As an elite institution whose goal was to provide the professional personnel who would take on positions at the nation's most prestigious corporations, Arnold's student clientele were soon-to-be members of the lonely crowd of organization men, and as such the nature of their educational experiences were directly relevant to the question of what manner of men would lead America.[19]

There were many reasons why educating for conformity by means of an overemphasis on convergent thinking could prove to be a danger to the modern world. Glimpses of this larger trouble could be caught in between Arnold's high-spirited descriptions of the Arcturan project, troubles that could be alleviated if the engineering mind could be re-designed. For example, Arnold pointed to the global issue of water shortages

> Almost all of the work done on this front concerns itself with ways to provide more water – but nobody asks how we use the water . . .
> as Buckminster Fuller points out, we use 100 gallons per capita every day – only one gallon of which is essential to our vital processes. The rest is just to wash ourselves and our possessions, and then to act as a kind of vast, inefficient conveyor system to carry dirt and rubbish down on a long trip to the sea. Perhaps we could clean many things better without water, or perhaps we could separate the dirt from the water without shipping all the water back to sea. In either case we might find completely different and better answers to the problem.[20]

Fifty years later, this question of creativity and engineering education is still a live issue. In 2004, three University of Wisconsin professors offered a conference paper on "Making the Strange Familiar: Creativity and the Future of Engineering Education." The authors state that "the creativity and innovation necessary to address the big issues facing civilization – maintaining the infrastructure; providing food, water, shelter and power to the population; and growing sustainably and safely – will only increase in importance," necessitating, they argue, a new emphasis on creativity in engineering education.[21] Maybe a little science fiction could help.

I would like to express my gratitude to Mr. Austin Baer for so generously sharing his recollections of the Arcturus Project with me, and for his permission to use his comments in this article and to reproduce his artwork.

1. Hartley E. Howe, "'Space Men' Make College Men Think," *Popular Science*, October 1952, pp. 124-127 & 266-268; p. 124, p. 125, p.126.

2. The articles are Howe, "Space Men"; John E. Arnold, "Space, Time and Education," *Astounding Science Fiction*, May 1953, pp. 9-25 (pp. 9-10 contain introductory remarks by John W. Campbell, Jr., the editor); Morton M. Hunt, "The Course Where Students Lose Earthly Shackles," *Life*, May 16, 1955, pp. 186-188, 190, 195-196, 198, 200. Arnold's piece is reprinted (without Campbell's remarks) in Jack H. Stocker, *Chemistry and Science Fiction* (American Chemical Society, 1998). The casebook has no author listed other than the MIT Creative Engineering Laboratory, Mechanical Engineering Department, but does have a notation of copyright, John E. Arnold, 1953; the title is *Case Study. Arcturus IV.* This is a personal copy in my possession.

3. Howe, "Space Men," p. 127.

4. Hunt, "Students Lose Earthly Shackles," p. 198.

5. Hunt, "Students Lose Earthly Shackles," p. 198, p. 188, p. 198.

6. Hunt, "Students Lose Earthly Shackles," p. 200, p. 196, p. 187, p. 196.

7. Fred Hapgood, *Up the Infinite Corridor: MIT and the Technical Imagination* (Reading, MA: Addison-Wesley, 1993), p. 110, p. 113, p. 111. On the cover issue: this had in fact happened when Creative Engineering student Austin Baer designed the cover for the *Astounding Science Fiction* issue in which Arnold's article on "Time, Space, and Education" had appeared.

8. Austin Baer Interview (written responses to a question list), July 2005, p. 4. This is in my possession. Arnold, "Space, Time and Education," p. 25.

9. Arnold, "Space, Time and Education," p. 25. The information on the Science Fiction Society is contained in the Friday, October 5th, 1954 issue of *The Tech*, the student newspaper. Viewed online at:

http://www-tech.mit.edu/archives/VOL_074/TECH_V074_S0164_P001.txt. Last accessed on October 5, 2005.

10. Howe, "Space Men," p. 124.

11. Hunt, "Students Lose Earthly Shackles," p. 195.

12. Arnold, "Space, Time and Education," p. 24.

13. Baer Interview, p. 5.

14. Arnold, "Cultural Blocks," pp. 4-5 (emphasis in the original).

15. Arnold, "Space, Time and Education," p. 22.

16. Hunt, "Students Lose Earthly Shackles," p. 190.

17. John E. Arnold, "Cultural Blocks on Creativity," p. 2, p. 3. This is contained in an unpublished mimeographed collection of papers by Arnold and others: John E. Arnold, "Summer Session Notes: Creative Engineering 1956" (Cambridge: Massachusetts Institute of Technology, 1956). Arnold conducted these summer workshops for men in industry. Arnold also used his Arcturus Project in these workshops, as noted in the *Life* article: "If any proof were needed that these improbable settings do actually serve their purpose superbly, it could be found during the two-week seminars that Arnold has given these past two summers to successful design engineers and research men from General Motors, Bell Telephone Laboratories, The Texas Company, RCA and a score of other notable American corporations. . . Almost without exception, the engineers who work with Arnold have enthusiastically thrown themselves into the Arcturus problem and afterward said that it has sent them back to their jobs with revitalized powers of creativity. These men have busily and happily planned fuel systems and engines for the Eggomobile, designed a compartmented conference room where earthlings and Methanians could each sit in their own atmospheres while talking to each other, and created novel kinds of auto instrument layouts adapted to Methanian capabilities (a driver with an X-ray eye doesn't need to have all his instruments in actual view). General Motors combustion experts debated whether liquid oxygen or liquid chlorine would be a better engine fuel in the frigid methane atmosphere, and a Bell Labs engineer designed a simple telephone system that would not require the Methanians to master complex electronics"; Hunt, "Students Lose Earthly Shackles," p. 196.

18. Arnold, "Cultural Blocks," p. 7.

19. An interesting near-contemporaneous set of interviews bears further on this issue for the MIT campus, suggesting that the educational process at MIT had about it itself an aura of conformity, in the overwhelming pressure placed on students to master an enormous body of information at any cost, as was indicated in Benson Snyder's study of MIT undergraduates and faculty, conducted from 1961 to 1964 and published in 1970 as *The Hidden Curriculum*. Snyder describes the frustrating bind that is experienced when "the student is exhorted to be creative and imaginative, to take risks, to strike out boldly and take responsibility for his own education and his own intellectual development . . . [and then] the student is confronted in all his courses with enormous masses of material to be learned, and for the most part, however he is exhorted, he is graded on his capacity to master the body of knowledge – on his competence rather than on his creativity." As he quotes one professor of mechanical engineering: "This premium [at M.I.T.] on the measured achievement which gives the constant rewards probably means that any except the real oddball will be seduced into putting his effort in that direction. Now in that sense . . . M.I.T. has always been that way – perhaps rightly so because it is probably what you want to educate for: conformity." See, Benson Snyder, *The Hidden Curriculum* (New York: Alfred A. Knopf, 1970), pp. 67-8, p. 73. Snyder was Dean of Institute Relations at MIT at the time.

20. Hunt, "Students Lose Earthly Shackles," p. 202.

21. W.B. Stouffer, Jeffrey S. Russell, and Michael G. Oliva, "Making the Strange Familiar: Creativity and the Future of Engineering Education," Session #1615, *Proceedings of the 2004 American Society for Engineering Education Annual Conference & Exposition* (American Society for Engineering Education, 2004). The authors note that "engineers are not commonly perceived as creative professionals. A Recent Harris Poll sponsored by the American Association of Engineering Societies and IEEE-USA found that 'only 2 percent of the public associate the word 'invents' with engineering; [and] only 3 percent associate the work 'creative' with engineering" (p. 3). They also note that "nowhere in the eleven ABET outcomes criteria, however, is there reference to creativity or to the need to teach creativity to students" (p. 5).

BOOK REVIEWS

***Encyclopedia of Science, Technology, and Ethics*.** Edited by Carl Mitcham. N.Y.: Macmillan, 2005. 4 vols. Pp. cxiv + 2378. Illus.; Bibliog. $425.

Current events bombarding the news with corporate and government ethics, natural disasters, terrorism, global warming, biotechnologies, virtual reality, and rapid technological advances accentuate the need for this *Encyclopedia.* *ESTE* is a masterful compilation that stimulates "co-constructive" reflection on and assessment of our twenty-first-century high technology world. It promotes a synthesis of applied ethics with primarily science, technology, engineering, and medicine. The editorial hand is skillfully evident as overviews, concepts, case studies, issues, persons, institutions, and philosophies are presented within a framework that emphasizes their interactions and relationships. The more than 670 entries, varying in length from 250 to 5000 words, are arranged alphabetically, yet each is structured to clearly state and document its relationship to *ESTE's* theme of multipath assessment. Sciences and technologies are primarily publicly evaluated in terms of risks and benefits, yet we now recognize the growing influence of a "values-related dimension." *ESTE's* public practice orientation is unique, avoiding duplication with major works such as the *Encyclopedia of Applied Ethics* (Academic Press, 1998), the more research-oriented *Encyclopedia of Ethical, Legal, and Policy Issues in Biotechnology* (Wiley, 2000), and the more narrowly-scoped *Encyclopedia of Bioethics* (Macmillan, 1978, 1996, 2004). *ESTE's* topical entries are indicative of multidimensional analysis and range from introductory overviews of "Engineering Design Ethics," "Science Policy;" and "Ecological Integrity;" to such concepts as "Normal Accidents" and "Selfish Genes;" to case studies of "Chernobyl," "Special Effects," and "Video Games." Selected issues are distinctly thought provoking, such as "Hacker Ethics," "Posthumanism," "Material Culture," and "Terrorism." In addition to instilling the ethical dimension, an emphasis is placed on integrating perspectives from diverse religious, political, cultural, linguistic, and philosophical traditions. The editor, advisory board, and contributors are stellar, established experts in science/technology/society studies. Each entry's authoritative thematic exposition and critical commentary are accompanied by a selective bibliography, a few internet resources, and often highly effective graphics or photographs. Special features of *ESTE*, contributing to its value and expected stature, are eight lengthy introductory essays that together demonstrate the power of the synthesis of multidimensional thinking, as triggered by analysis of such issues as nanotechnology, evidence, technical design, and citizen participation in governing science. Appendices include an extensive chronology of historical events related to the interaction of science, technology, and ethics, and a compilation of applied ethics codes. A couple minor problems do not detract from *ESTE's* overall excellence. Attribution is not provided for some ethical code documents, such as the "Technorealism Manifesto." Some topics may be omitted because of extensive coverage elsewhere, but they would have been welcome, such as "Love Canal," and a focused entry on "identity" in our cyberworld. *ESTE* is destined to be a classic research/reference work.

Judith Adams-Volpe
Director, Communication & Development
University at Buffalo Libraries

Technology and the Future, 10th ed. Albert H. Teich. Florence, Ky.: Wadsworth Publishing, 2005. Pp. 338. Illus. Paperback, $43.95.

This year marks the 10th edition of *Technology and the Future*, a milestone for author Al Teich; since the first edition was published in 1972, the book has now been in print for 30 plus years. To mark the event, Teich wrote a forward-looking and thoughtful preface identifying the ten key technologies he thinks have had a significant on our daily lives since 1972. His list is not only a great way to celebrate the moment, but also a smart way to engage a new audience. Who of us in the next generation (bullet-point readers) can resist a list?

Nationally, as of 2006, there are about 100 undergraduate Science, Technology and Society programs. STS programs were started in the anti-nuclear, anti-Vietnam era; they challenged the students who would become the new managerial and technological elite to be accountable for the consequences – intended and unintended – of technology. STS programs grew more slowly through the breathless rhetoric of 1980s and 1990s communications and computing revolution. They speak now to citizens with fractured identities spread across a Net of spaces, to students drowning in a sea of dubiously useful bits of information. It's good news that an anthology such as *Technology and the Future* continues fresh and relevant: the eras are very different, but the problems are just as intransigent. In this current volume, recent issues such as technology, civil liberties, and terrorism and global climate change have been addressed.

Al Teich is the Director of Science and Policy Programs for the American Association for the Advancement of Science. His general interests range across science and technology policy, federal budgeting and priority-setting for research, the future of the research university and the mutual impacts of technology and society. With so wide a range of interests, the book's slim size demonstrates some selective rigor on Teich's part: it takes more effort to be usefully accessible to undergraduates than it does to be an all-inclusive tome. The book also demonstrates disciplined growth. At 338 pages, and thirty articles, the new edition has just eight more pages and one more article than the last. In total, seven articles have been exchanged for eight new articles. Among those no longer included are "Buddhist Economics" by E. F. Schumacher and "Technological Politics as if Democracy Really Mattered" by Richard Sclove. I particularly miss "Western Colonialization of the Future" by Ziauddin Sardar since his article addressed Western ideologies in globalism directly. I'm also sorry to see the loss of the category *Gender, Ethnicity, Race and Technology*; in a world so sharply divided, it behooves students to look at these gaps before they face them in business, at home, in life. A new article in a future edition might draw from the arts, in a Gibson-esque vein: what does it feel like, smell like, taste like, to live embedded in technology? And Teich might at some point wish to revisit the technological issues for the developing world, with special reference to India and China. Altogether, however, the current mix is good, offering a broad range of issues in direct, vigorous prose. Notable additions to this edition are selections from the 9-11 Commission report, "Promise and Peril" by Ray Kurzweil, and "Global Climate Change" by Thomas Karl and Kevin Trenberth. A terrific new article on culture and technology is Edward Tenner's "The Technology of Shoelaces" (2003). Who knew there was so much to learn from so pedestrian an object?

In the fall semester of 2005, I taught "Technology and Human Values" with this new edition. At the end of class, I polled my students and discovered that the class favorites were a mix of "older" and more contemporary writers: Langdon Winner, Wendell Berry, Edward Tenner, Samuel Florman, Judy Wajcman and Leo Marx. Students responded especially strongly to their first contact with Wendell Berry, and continued to reference him throughout the semester: in some ways he served as a lightning rod for those with strongly optimistic and strongly pessimistic views of technology. They also repeatedly referenced the concept of the "technological fix" in Alvin Weinberg's "Can Technology Replace Social Engineering?"(1966). Many were attracted by the Samuel Florman's notion of "tragic" technology: grownups put away pettish disappointment in and childish optimism for technology, understanding that whatever we do, we are forever trying to rise above an inevitable fall. A smaller minority relished Langdon Winner. They saw the naming of names and structures as a way to specify and correct concrete wrongs.

Teich's book remains a rarity in the undergraduate field. Among other possibilities are *Visions of STS: Counterpoints in Science, Technology and Society Studies*, Cutcliffe and Mitcham (State University of New York Press, 2001), which has an equally broad range of authors, but focuses more sharply on interdisciplinary issues within the field of STS. Harry Collins and Trevor Pinch have two lively casebooks, *The Golem: What*

Everyone Should Know About Science and *The Golem at Large: What You Should Know About Technology* (Cambridge UP, 1988) that would serve well in an undergraduate course, but do not offer the same variety of theoretical approaches that *Technology and the Future* offers. Another choice might be Thomas Easton's *Taking Sides: Clashing Views on Controversial Issues in Science, Technology and Society*, 7th ed. (McGraw-Hill/Dushkin, 2006). Other useful STS anthologies -- Mario Biagioli's *The Science Studies Reader* (Routledge,1999) and Shiela Jasanoff *Handbook of Science and Technology Studies* (Sage Publications, 1995) -- are aimed at the graduate level.

What's on Teich's list of important technologies? You might guess his first two, "ubiquitous computing" and "the Internet"-- but you'll have to get the book to read the rest. Teich's thirty-year retrospective of significant technologies invites, inevitably, contemplation of the future. I predict that many of our students will spend their careers learning continuously ***and*** defending themselves from those who are younger, cheaper, and more recently educated. This anthology does a good job of presenting the way technology shapes the world and the way the world shapes technology and helps students prepare for some of the consequences that they -- and we -- cannot predict.

Christine M. Pense
Department of History
Lehigh University

Mikael Hård and Andrew Jamison, ***Hubris and Hybrids: A Cultural History of Technology and Science***. New York: Routledge, 2005. Pp. xv + 335. Illus., Bibliog. Paperback, $29.95.

The main theme that runs through this interesting new text is that science and technology are double-edged swords, serving to transform human societies, at both the individual and collective levels and in terms of our ties to the environment, and they do so sometimes for the better and sometimes for the worse. Part of the problem is that we don't always know how to tame the *hubris* of our innovative spirit. To make effective use of this techno-scientific spirit, we need to become *hybrids* through the recognition that we cannot effectively separate the human and the nonhuman. Part 1 of the book examines the scientific and industrial revolutions; Part 2 examines intellectual representations of techno-science; Part 3 covers specific areas of application—transportation, communications, health and sanitation; and Part 4 deals with issues of policy with an eye toward "coping with techno-science." The authors ultimately seek reflectively to understand how we culturally appropriate science and technology and give them human meaning. They do so with a view to damping down unwarranted, uncritical *hubris* but without denying the very real improvements techno-science has brought to the human condition in a more critically nuanced "middle ground."

Steven Yearly, ***Making Sense of Science: Understanding the Social Study of Science***. Thousand Oaks, Calif.: Sage, 2005. Pp. xv + 205. Bibliog. Paperback, $97.95.

Yearly has provided a very concise introduction to the sociology of science studies, but includes relatively little on technology. He begins with a discussion of what, if anything, makes science special as a way of knowing. He then examines key approaches or schools of thoughts within science studies: the Strong Programme and the Empirical Programme of Relativism; Social Interests; Actor Network Theory; Gender and Science Studies; Ethnomethodology; and Reflexivity in Science Studies. Following these brief chapter-length summaries he discusses a series of applications of science studies—scientific expertise and the public, risk analysis, science in the law, and science and policy, all areas of well-developed research in the field. Yearly hopes on the one hand to make Science Studies more intelligible to and better integrated within the field of sociology more generally, and at the same time defuse the 'resistance' toward the field by those practitioners—sociological and scientific—who may not fully appreciate the problematic sides of techno-science developments for society.

Stephen H. Cutcliffe, Ed.

Readings That Help

This section of the *Newsletter* is meant to guide the reader to books or articles that someone recommended to me because they are useful, provocative, or enjoyable—at best, all three. Suggestions of other materials to be reviewed would be most welcome, with or without comments, but I hope you feel free to comment on my opinions as well.

Barrett Hazeltine
Division of Engineering, Brown University

Anderson, John D. Jr. *Inventing Flight: The Wright Brothers and Their Predecessors.* Baltimore: The Johns Hopkins University Press, 2004. Pp. viii + 176. Paperback, $18.95.

Many people do not realize how much solid engineering preceded the first flight of the Wright brothers; experimenters in Europe and the United States had done much of this. Orville and Wilbur Wright did resort to making their own careful measurements of lift and drag, partly because they did not trust published results. Ironically, they had misinterpreted the published data. Forty or so years earlier, Otto Lilienthal, in a fashionable Berlin suburb, had tested various shapes of airfoils, some by whirling them on a 23-foot arm. In 1893, Lilienthal built the first hang glider and a 50-foot hill from which to test it. After several years of glider experiments, Lilienthal was killed when his glider caught in a thermal eddy. Anderson claims that if the Wright Brothers had not been successful at Kill Devil Hills, then the first airplane would have flown in Europe within ten years. Early aeronautics was a field where engineering preceded the science; the great scientific minds of the times either ignored or disparaged efforts to design a heavier-than-air flying machine. The Wright Brothers and others were not "flying blind" in their efforts; they used their intuitive understanding of the physics involved. *Inventing Flight* differs from many histories of early flight by including careful, accessible sidebars explaining the science. For example, the first of these is a one-paragraph explanation of Newton's Velocity Squared Law. The book is a model of what technological writing should be–lucid and lively writing, clear pictures and diagrams, valid science. It is an inspiration for beginning students and a good read for others.

Bernstein, Peter L. *Wedding of the Waters: The Erie Canal and the Making of a Great Nation.* New York: W.W. Norton, 2005. Pp. 288. Paperback, $15.95.

The Erie Canal was a major technological achievement. The locks at Lockport, built basically by hand, at the Niagara Escarpment raised (or lowered) the canal 60 feet in five stages. Another stage was avoided by blasting, using crude blasting powder and hand-held drills, a channel seven miles through the escarpment rock. The total lift along the canal was 675 feet—about 250 between Albany and Schenectady and another 200 before Utica. The canal was probably only feasible because a gorge existed in the Mohawk River valley—the only break in the Appalachian Mountains between Atlanta, Georgia, and the St. Lawrence River. One other piece of technology should be noted—the aqueducts. One of these carried the canal the length of three city blocks across the Genesee River—the Marquis de Lafayette called it "an aerial route." The book's focus, though, is on the politics surrounding the planning and construction, rather than the technology. In the case of the Erie Canal a government-sponsored project was completed on time with only a minor cost overrun. The canal made it feasible to transport much grain from the American Mid-West to the industrial Midlands of England, making industrial growth there possible and binding the United States and Europe together. The canal is thus an early example of globalization and how a technological development could be a significant influence on a major social change. This is a rich and engrossing story.

Fanchi, John R. *Energy in the 21st Century*. Singapore: World Scientific Publishing, 2005. Pp. ix + 256. Hardcover, $52.00.

This is an admirable short book that summarizes dispassionately energy issues for the general reader. Energy options discussed range from fossil fuel to biomass and synfuel. Distribution, energy economics, and energy forecasts are also reviewed. The data important to rational discussion seems all to appear. One example is the first graph, which shows the UN Human Development Index as a function of per capita energy consumption; the knee of the graph is at about 2000 kw/year. Consumption in the US was 12,838 in 1999; Norway was highest at 24,773.

Three scenarios are analyzed for energy consumption through the 21st century: continued reliance on oil and gas, end of the internal combustion engine, and shift to a mix of sources with high use of renewables. The second scenario assumes successful development of hydrogen technology. Hydrogen is a useful carrier of energy because the predominant combustion product is water vapor. Production of hydrogen requires energy; electrolysis is the most promising process, but thermal decomposition or gasification are possible. Hydrogen is flammable when mixed with air, but its low density means that it will dissipate quickly into the atmosphere. Fanchi believes the major environmental problem with nuclear fission is storage of nuclear waste. In comparing nuclear energy to fossil fuels the cost and risk of such storage must be balanced against the consequences of greenhouse gases. For a subject that can arouse much passion, this treatment seems fair. It is certainly lucid and accessible and a good entry into more details.

Lakwete, Angela. *Inventing the Cotton Gin: Machine and Myth in Antebellum America.* Baltimore: The Johns Hopkins University Press, 2003. Pp. xiii + 232. Paperback, $25.00.

Much of the narrative is a meticulous recounting of how cotton gin technology changed from 1607 until 1870. Lakwete notes that contemporary farming journals "must be read slowly and carefully, lest the eye gloss over the single-line notice placed by a parsimonious mechanic." It is hard to believe she missed many, if any, such notices. She does debunk the myth that Eli Whitney, a northerner visiting the South, invented the first cotton gin. Roller gins, devices for removing the seeds from cotton, were in use in the fifth century C.E. and were employed in colonial America probably from the earliest days; certainly they were well established before Whitney's invention. Two varieties of cotton are grown in the southern United States–long fiber and short fiber. Short fiber is easier to grow, but the roller gins worked better with the long fiber but not with the short. Whitney's saw gin, patented in 1794, was more effective–the daily output per person was greater–with the short. The rest of the story is continuous improvements, many by unrecognized local mechanics, in both the roller gin and the saw gin. Gin technology flourished throughout the South and also in Massachusetts. A theme in popular history is clever northerners versus conservative southerners–the legend that before Whitney's gin seeds were removed from cotton by slaves finger plucking, a legend that ignores the existence of the roller gin. A related theme is the imputed inferiority of American technology compared to British. Because the saw gin made large-scale cotton farming profitable, it is accused of being the device that perpetuated slavery. A more accurate interpretation appears to be that southern ingenuity and entrepreneurism, together with enslaved African labor, was the basis of the success of the cotton industry. Some of the details make the book slow going for the general reader, but the overall picture is meaningful and valuable.

Leavitt, Steven D. and Stephen J. Dubner. *Freakonomics: A Rogue Economist Explores the Hidden Side of Everything.* New York: Harper Collins, New York, 2005. Pp. xii + 242. Hardcover, $17.00.

Analysis of repeated electoral challenges shows that the amount of campaign spending hardly affects the outcome of an election. A study of the behavior of real estate agents in selling their own property indicates they could do better for their clients. Looking at the numbers indicates it is safer to have your child visit a house where guns are kept than one with a swimming pool. Firsthand observations of a gang selling drugs showed that only the top person makes a substantial income. The drug industry is much like McDonalds, with many low paid workers in disagreeable jobs supporting a few prosperous managers—the equivalence loses some of its force when we learn that the manager described is now in jail. The situations listed above are some of those discussed in this book. The one that appears to get the most attention is the relationship between the drop in crime to the increased availability of abortion; to be crude and insensitive, many potential criminals simply are not born if abortion is possible. The common message in these intriguing stories is the necessity to measure, to look objectively, to disregard conventional wisdom. The writing is lively and informed, but I suspect most readers of this publication would appreciate more detail. This book would be an excellent first week reading for a course in quantitative methods.

OPEN FORUM

Calls for Papers/Conference Announcements

Fourth International Conference on the History of Transport, Traffic and Mobility
Paris and Marne-la-Vallée, France
September 28-October 1, 2006

The International Association for the History of Transport, Traffic and Mobility (T2M) invites proposals for papers to be presented at the Fourth International Conference on the History of Transport, Traffic and Mobility, to be held in Paris and Marne-la-Vallée, France on September 28-October 1, 2006.

Papers may address any aspect of the social, cultural, economic, technological, ecological and political history of transport, traffic and mobility. However, we encourage the submission of proposals relating to the conference theme: History, Safety and Sustainable Mobility.

The interplay between safety and sustainability opens up important lines of historical inquiry. In what ways do the values of safety and sustainability shape the expectations of mobility users, producers and regulators? For example, beginning in the 1970s, the resurgence of the tram, in opposition to the automobile, in urban centers initiated a series of intense debates. In France, for example, several social science research projects (*RATP Réseau 2000*, *Institut pour la Ville en Mouvement*, etc) were established to address the debate. It is hoped that this theme will generate new objects and methods of inquiry in the emerging field of mobility history.

Such a broad subject suggests the value of interdisciplinary approaches. Relevant contributions from cultural geographers, sociologists, anthropologists, economists, and other scholars who do not define themselves as historians are therefore very welcome, as well as those from historians who are not specialists in T2M. Participants are encouraged, though not required, to organize panels on this or any other theme. A panel consists of a chair and normally up to three speakers; no commentator is required. We encourage transnational, comparative and transmodal approaches, and welcome proposals exploring theoretical or methodological issues as well as those of a more empirical nature. We especially invite recent entrants to the profession and doctoral students to submit proposals.

This conference will be hosted by Centre d'Histoire Sociale du XXe siècle, University Paris I Panthéon-Sorbonne, and the Ecole Nationale des Ponts et Chaussées. The conference language is English and French, all the working panels should be in English.The deadline for abstracts and a short cv (max. 1 page each; Word or rich text format only) is **March 31, 2006**. Send proposals to: submissions@t2m.org. Notification of acceptance will be sent by April 30, 2006. The full text of papers accepted must be submitted by July 15, 2006 if they are to be included on the conference CD-ROM sent in advance to all participants and if they are to be eligible for T2M Awards. All participants are absolutely required to register before September 1, 2006, in order to secure the conference programme.

For enquiries about the programme, please contact Mathieu Flonneau, Université Paris I, (Mathieu.Flonneau@univ-Paris1.fr) and Vincent Guigueno, Ecole nationale des Ponts et Chaussées (vincent.guigueno@m4x.org). For information about local arrangements please contact: vincent.guigueno@m4x.org. For information about T2M and previous conferences, please visit: http://www.t2m.org.

Annual Meeting of The Society for the History of Technology
Las Vegas, Nevada
October 12-15, 2006

The program committee of the Society for the History of Technology is seeking paper and panel proposals on any topic in the history of technology, broadly defined, from members or from those new to SHOT, regardless of discipline, for its annual meeting to be held in Las Vegas, Nevada, October 12-15, 2006. Of special interest for 2006, are proposals that engage with the following themes: Technology, Games, and Entertainment; Technology, Race, and Ethnicity; or Conversations between History of Technology and other disciplines.

For the 2006 meeting, the program committee is also encouraging unconventional sessions, that is, session formats that vary in useful ways from the typical three/four papers with comment. These might include (but are not limited to) sessions with no formal commentator, workshop-style sessions with papers that are precirculated electronically, or "author meets critics" sessions.

The program committee's highest priority in evaluating paper and panel proposals is scholarly excellence. In evaluating panel proposals, the program committee is especially interested in sessions that team established and younger scholars, and/or draw participants from multiple institutions and multiple countries.

The deadline for proposals is **March 15, 2006**. Please submit your proposals to: light@northwestern.edu.

Proposals for individual papers must include: a one-page abstract (maximum 600 words) indicating the paper topic, argument(s) made, and evidence base used; a one-page c.v.; and a completed AV equipment request form (available on the SHOT website). Proposals for complete sessions must include: a complete description of the session that explains how individual papers contribute to an overarching theme; a list of the presenters' names and paper titles; for each presenter, a one-page abstract (maximum 600 words) indicating the paper topic, argument(s) made, and evidence base used, as well as a one-page c.v.; for the commentator (if any), chair, and session organizer (if s/he is not one of the session's panelists), a one-page c.v.; for each presenter, and for each presenter, a completed AV equipment request form (available on the SHOT website). Panel proposals sponsored by any SHOT special interest group should be clearly indicated.

Submission instructions are as follows:
--Materials should be sent in a single email message to: light@northwestern.edu with electronic copies of all elements of the complete proposal as attachments formatted in Microsoft Word (any version of Word is fine, but it must be in Word).
--Whether submitting an individual paper or a complete panel, the program chair needs to receive a separate attachment for each item (c.v., proposal, and AV request form).
--Proposals are to be saved with your last name and the word "proposal" (for example, "brown.proposal.doc")
--Your c.v. is to be saved with your last name and the word "vitae" (for example, "brown.vitae.doc")
--In case of a panel, individual abstracts and c.v.s are to be saved with the presenter's last name and the word "abstract" or "vitae" (for example, "brown.abstract.doc" and "brown.vitae.doc")

While SHOT rules exclude multiple submissions (i.e. submitting more than one individual paper proposal, or proposing both an individual paper and a paper as part of a session), scholars may both propose a paper and serve as a commentator or as session chair. Since SHOT 2007 will be the organization's 50th anniversary celebration, scholars interested in presenting work on the history of SHOT are asked to defer those submissions until next year. Presenting at the 2006 meeting will not rule out presenting in 2007, as SHOT is waiving its customary rule preventing scholars from presenting at two consecutive domestic meetings.

Please note that due to cost factors, SHOT cannot guarantee the availability of digital projectors for all sessions. Those with access to projectors are encouraged to bring their own, and to let the program committee know if they might have equipment to share. For more information about AV equipment, please see the online AV request form.

Additional information about the 2006 meeting can be found online at
http://www.shot.jhu.edu/Annual_Meeting/Annual_Meeting_Main_Page.htm
For questions about the program themes, submission guidelines, or any other aspects of the Call for Papers, please email Jen Light, Program Committee Chair: light@northwestern.edu <mailto:light@northwestern.edu>

Silence, Suffering and Survival
Vancouver, B.C., Canada
November 2-4, 2006

The Society for Social Studies of Science (4S) will hold its 2006 annual meeting in Vancouver, B.C., Canada, November 2-4, 2006. Celebrating the 30th anniversary of the society, the conference will be co-located with the History of Science Society and Philosophy of Science Association, which will be in a hotel a few blocks away. "Information Central" for the meeting this year is at: http://www.4sonline.org/meeting.htm.

This year's theme is "Silence, Suffering and Survival", and it is designed to explore the overlooked spaces, boundaries, actors, networks, and artifacts of science and technology. We welcome papers and panels that address questions about the silences of silencing, unintended consequences, and persistence in science, technology and STS. The topic is meant to open up and stir discussion about theorizing in areas we may have overlooked such as the process of secrecy under which processes of silence are often conducted. Possible topics might include the science and technology of slavery, disability, survival, warfare, peace, and quantification. Discussions might address demoralization and remoralization within science, technology and STS, the sort of silence/noise created by technology/science, and how technology/science create and alleviate suffering and/or survival. This could include processes of survival that are often off the record, such as workarounds, "older ways of knowing", older (non-scientific) ways of knowing, and …?

Online submission is now open for both abstracts and sessions, with a deadline of **April 3, 2006**.

We will be exploring some new session formats this year, including new media presentations, "fireside chats," and junior-senior sessions. Some sessions at the Vancouver 4S will be designated as "working sessions." For these sessions, papers will be made available online in advance of the conference so that panel members and attendees will be able to read them before arriving; the conference session then will be an opportunity for more substantial discussion. If you would like to organize or contribute to a working session, please contact Josh Greenberg, Tarleton Gillespie, or Sergio Sismondo. If you have ideas for these or other session formats, please contact the Program Chair: Wenda Bauchspies.

4S members are invited to use the Discussion Board in the Members Section of the web site to announce ideas for panels and invite participation. Log in.

As we are planning the 4S meeting exhibits for Vancouver in 2006, it is also helpful for authors to send us notification of their recent publications, and to remind their editors or marketing contacts at their publishers that they will be attending a conference and would appreciate display copies or other promotional materials, or publisher exhibits, at these meetings. More information will be available as we coordinate the exhibit plans with HSS/PSA for the annual meetings. Please contact Jennifer L. Croissant or the Program Chair Wenda Bauchspies for more information.

Food Chains: Provisioning, Technology, and Science
Hagley Museum and Library
Wilmington, Delaware
November 3-4, 2006

The Center for the History of Business, Technology and Society invites paper proposals on the provisioning systems that supply our world with food, for a conference to be held November 3-4, 2006. By provisioning we emphasize the complex institutional arrangements necessary for food to move from farm to the dinner table, along with the dramatic impact of science and technology. We invite proposals for papers that historically situate the connections among the array of institutions involved in food provisioning, including but not limited to farms, food research laboratories, equipment suppliers, food processors, transportation systems wholesale and retail outlets, government bodies, and non-government organizations and associations. Proposals are also encouraged that examine the relationships between scientific and technological innovations and food provisioning dynamics. Papers may consider any area of the world after 1600.

Proposals should be no more than 500 words and be accompanied by a short cv. Deadline for submissions is **March 31, 2006**. Proposals will be evaluated by the program committee of Warren Belasco, Roger Horowitz, and Philip Scranton. Travel support may be available for those presenting papers at the conference.

To submit a proposal or for more information, contact Carol Lockman, Hagley Museum and Library, P.O. Box 3630, Wilmington, Del. 19807, phone: 302-658-2400 ext. 243, fax: 302-655-3188 or e-mail: clockman@Hagley.org

Entrepreneurial Communities
Cleveland, Ohio
June 1-2, 2007

The 2007 annual meeting of the Business History Conference (BHC) will be held Friday and Saturday June 1-2, 2007, in Cleveland, Ohio, at the **Weatherhead School of Management** of Case Western Reserve University.

The theme for the conference is "Entrepreneurial Communities," defined broadly in scope and scale. The entrepreneur is often thought of as a lone innovator, but how often does an entrepreneur really act alone? How and when does entrepreneurial activity rely on the input of other inventors, venture capitalists, lawyers, accountants, marketing specialists, government actors, laborers, and others? We are interested in papers that explore the roles of these actors and the broader social context in which entrepreneurial activity takes place. These include, but are not limited to, geographic (local, regional, national, or international), political, economic, social, and cultural (including the roles of race, class, ethnicity, religion, and gender) aspects of entrepreneurial communities. We are interested in papers that consider how firms and other groups (within, between, or outside particular firms) and society as a whole have organized themselves to foster or inhibit entrepreneurial activity. Finally, in keeping with our longstanding Business History Conference policy, the committee will also entertain submissions that are not directly related to the conference theme.

Potential presenters may submit proposals either for individual papers or for entire panels. Individual paper proposals should include a one-page abstract and a one-page curriculum vitae (cv). The abstract should summarize the argument of the paper, the sources on which it is based, and its relationship to existing scholarship. Each panel proposal should include a cover letter stating the rationale for the session, a one-page abstract and author's cv for each proposed paper (up to three), and a list of preferred chairs and commentators with contact information.

Proposals also are invited for the **Herman E. Krooss Prize** for the best dissertation in business history. The Krooss Prize Committee welcomes submissions from recent Ph.D.s (2004-7) in history, economics, business ad administration, history of science and technology, law, and related fields. To participate in this competition, please indicate this in a cover letter, and include a one-page cv and one-page dissertation abstract. Semi-finalists will be asked to submit copies of their dissertation after initial review of proposals. Finalists will present summaries of their dissertations at the Cleveland meeting.

Doctoral candidates who wish to have their dissertations discussed can participate in special dissertations-in-progress sessions. Please submit a cover letter to this effect, along with a one-page cv and one-page dissertation abstract, clearly indicating that the submission is a dissertation abstract. BHC also awards the **K. Austin Kerr Prize** for the best first paper by a Ph.D. candidate or recent Ph.D. candidate (2004-7). If you wish to participate in this competition, please indicate this in your proposal. Please note that all proposals accepted for the Krooss Prize panel and the dissertations-in-progress sessions are not eligible for the Kerr Prize.

The deadline for receipt of all proposals is **October 15, 2006**. Notification of acceptances will be sent by January 2007. Presenters will be expected to submit abstracts of their papers for posting on the BHC website. In addition, presenters are encouraged to post electronic versions of their papers prior to the meeting, and to submit their papers for inclusion in our on-line proceedings publication, **Business and Economic History On-Line**. The BHC also offers graduate students who are presenting papers grants to offset some of the costs of attending the conference.

Please send all proposals to: Dr. Roger Horowitz, Secretary-Treasurer, Business History Conference, P. O. Box 3630, Wilmington, DE 19807, USA. Phone: (302) 658-2400; fax: (302) 655-3188; email: **rh@udel.edu**.

Job Announcement

Assistant Professor of the History of the Biological Sciences
Department of History and Philosophy
Montana State University

The Department of History & Philosophy at Montana State University, Bozeman, is pleased to announce a new tenure-track opening at the Assistant Professor level in the history of the biological sciences to begin August 2006. While specialty remains open, we are particularly interested in scholars working in non-U.S. fields.

This is an exciting development for our department. We have a vibrant undergraduate and graduate curriculum, including a recently designed PhD program, with options in the history of science, environment, technology and society (SETS). Our faculty is intellectually energetic, with several recent tenure-track hires researching and teaching in SETS. Information regarding the position can be found at the MSU webpage: http://www.montana.edu/cgi-bin/msuinfo/fpview?ctype=f&csn=6233-2

The Department is also currently searching for a postdoctoral fellow as part of the NSF-funded program entitled Mile High, Mile Deep: Imagining and Modifying Topographical and Subterranean Environments. An interdisciplinary research project, "Mile High, Mile Deep" seeks to integrate the history of science and technology, environmental history, and historical geography. Information regarding this fellowship can be found at http://www.montana.edu/cgi-bin/msuinfo/fpview?ctype=p&csn=6234-3, or by contacting either Michael Reidy mreidy@montana.edu or Brett Walker bwalker@montana.edu

FORTHCOMING MEETINGS AND CONFERENCES

March 10, 2006. *How Business Users Shaped Modern Technologies.* The Center for the History of Business, Technology, and Society. Hagley Museum and Library. Wilmington, Del. Contact: Carol Lockman at clockman@Hagley.org or by phone: (302) 658-2400, ext.243. **For details, see *STS Newsletter* #141, page 16.**

March 29-April 3, 2006. *A River Runs Through Them: Landscapes in Environmental History.* American Society of Environmental History. Annual Meeting. Radisson Hotel. St. Paul, Minn. Contact: John Anfinson, e-mail: John_Anfinson@nps.gov or visit the ASEH website: www.aseh.net

April 22-23, 2006. International Multidisciplinary Graduate Student Conference. American Association for the Advancement of Science Headquarters. Washington, D.C. For more info: e-mail: abstract@stglobal.org or visit the conference website: www.stglobal.org.

June 8-10, 2006. *Political Economy of Enterprise.* Business History Conference. Annual Meeting. Munk Centre for International Studies of the University of Toronto. Toronto, Canada. Contact: Dr. Roger Horowitz, Secretary-Treasurer, Business History Conference, P.O. Box 3630, Wilmington, Del. 19807, USA. Phone: (302) 658-2400 or fax: (302) 655-3188 or e-mail: rh@udel.edu **For details, see *STS Newsletter* #139 & 140, page 21.**

June 8-10, 2006. *Disaster Preparedness and Recovery.* IEEE Society on Social Implications of Technology. 2006 International Symposium on Technology and Society. Queens College, City University of New York. New York. For more info: http://www.ieeessit.org

June 14-18, 2006. Sixth International Congress of the International Society for the History of Philosophy of Science. Paris, France. Contact: Anastasios Brenner (anastasios.brenner@wanadoo.fr) or Marthe Tournou (tournou@paris7.jussieu.fr) or visit the HOPOS 2006 conference website at http://www.sps.ens.fr/activites/hopos2006/indexhopos.html. **For details, see *STS Newsletter* #141, page 16.**

September 21-24, 2006. *The Commerce and Politics of Science.* The John J. Reilly Center of the University of Notre Dame. Notre Dame, Indiana. For more info, visit the conference website: <http://www.nd.edu/~reilly/compolsci.html>

September 28-October 1, 2006. Fourth International Conference of The International Association for the History of Transport, Traffic and Mobility (T2M). Paris and Marne-la-Vallée, France. For enquiries about the programme, please contact Mathieu Flonneau, Université Paris I, (Mathieu.Flonneau@univ-Paris1.fr) and Vincent Guigueno, Ecole nationale des Ponts et Chaussées (vincent.guigueno@m4x.org). For information about local arrangements please contact: vincent.guigueno@m4x.org. For information about T2M and previous conferences, please visit: http://www.t2m.org **For details, see page 13.**

October 12-15, 2006. Annual Meeting of The Society for the History of Technology. Las Vegas, Nevada. Contact: Jen Light, Program Committee Chair: light@northwestern.edu or visit the SHOT website: http://www.shot.jhu.edu/Annual_Meeting/Annual_Meeting_Main_Page.htm **For details, see page 14.**

November 2-4, 2006. *Silence, Suffering and Survival.* The Society for Social Studies of Science (4S). Annual Meeting. Vancouver, British Columbia. Contact: Jennifer L. Croissant or the Program Chair Wenda Bauchspies or visit: http://www.4sonline.org/meeting.htm **For details, see page 15.**

November 2-5, 2006. Annual Meeting of the History of Science. Joint meeting with the Philosophy of Science Association and the Society for Social Studies of Science. Vancouver, British Columbia. Contact: Jay Malone, HSS Executive Office, P.O. Box 117360, University of Florida, Gainesville, Fl. 32611, e-mail: meeting@hssonline.org or visit: http://www.hssonline.org/2006%20Meeting/2006mainframe.html **Deadline for submissions is April 3, 2006**.

November 3-4, 2006. *Food Chains: Provisioning, Technology, and Science.* The Center for the History of Business, Technology and Society. Hagley Museum and Library. Wilmington, Del. Contact: Carol Lockman at clockman@Hagley.org or by phone: (302) 658-2400, ext.243. **For details, see page 16.**

June 1-2, 2007. *Entrepreneurial Communities.* Business History Conference (BHC). Annual Meeting. Cleveland, Ohio. Contact: Dr. Roger Horowitz, Secretary-Treasurer, Business History Conference, P. O. Box 3630, Wilmington, Del., 19807. Phone: (302) 658-2400; fax: (302) 655-3188; email: **rh@udel.edu**. **For details, see page 16.**