Appendix 3 Major Themes in Technology and Culture

This appendix has been designed to help the reader follow the complex discussion of the many subordinate themes discussed in chapters 2 through 5. It depends on the complete bibliography, with short titles, of TC's 272 articles following the appendixes. The subordinate themes are presented here in the same sequence as in the text. Every article is identified by author and when necessary by its number in the bibliography. The appendix can also be used as a detailed thematic index of the book because each set of articles is accompanied by page references to the discussion of the subtheme.

The process of scoring TC's articles, as described in appendix 1, is endless in principle. It is certainly conceivable that articles could be found which belong on one of the following lists and which have escaped my attention. My claim is only that the articles listed refer to the theme or subordinate theme in question, not that the lists are necessarily exhaustive.

Emerging Technology (Chapter 2)

1. The act of invention

1. **Verification of the true inventor or the origin of an invention (p. 40)**
   Balmer, Bedini (9), Bowles, Bray, Brittain (18), Bryant (21, 22, 24), Cardwell (37), Chapin, Dresbeck, Emmerson, Fox, Fryer and Marshall, Hacker (90), Hounshell, H. Jones, Keller (128), Kerker, Kreutz, Leighton (146), Mayr (156), Puhvel, Post (192), Reti (204, 205), Robinson, Roland, Scherer, Schmandt-Besserat, C. Smith (233), Tucker, White (260, 261), Wik (264) (35 articles)
2. **Communication of the significance of the invention (pp. 40–41)**
   Brittain (18), Bryant (22, 24), Chapin, DeWalt, Hounshell, Post (191, 192), Reynolds, Robinson, Wise (11 articles)
3. **The nature of the act of insight (pp. 41–42)**
   Agassi, Constant, Hughes (113), White (261) (4 articles)

4. **The personality and motivation of the inventor (pp. 42–43)**
   Brittain (18), Constant, Ferguson (71), Fryer and Marshall, Harrison, Hounshell, Jensen and Rosegger, Mayr (156), Robinson, Scherer, C. Smith (233), Watson-Watt, Wise (13 articles)
5. **The intellectual background of the inventor (p. 43)**
   Brittain (18), Bryant (21, 22, 24), DeWalt, Fox, Fryer and Marshall, Hounshell, Jenkins, Kerker, Layton (144), Mayr (156), Reynolds, Scherer (14 articles)
6. **Inventive insight as origin of innovation process (pp. 43–44)**
   Bryant (21, 22, 23, 24), Chapin, Constant, DeWalt, Finch, Hewlett (104), Jenkins, Mayr (156), Rürup, Scherer (13 articles)
7. **Inventive insight as the conceptual element throughout the process of invention (pp. 44–45)**
   Agassi, Brittain (18), Bryant (23, 24), Hounshell, Jevons, Kerker, Layton (142), Robinson (9 articles)

2. Development

1. **Developmental activity based on model building and testing of models (pp. 45–46)**
   Brittain (18), Bryant (21, 24), Chapin, Constant, Dornberger, Frazier, Hagen, R. Hall, Hanieski, Harris and Pris, Hewlett (103, 104), Hills and Pacey, Hughes (112, 113, 114), Jenkins, Jewett (122), Kraus, Layton (144), Leslie, Mayr (156), Miles, Nunis, Fulton, and McCarthy, Pearson, Pendray, Perry, Post (191), Rasmussen, Reynolds, Roach, Robinson, Ruttan and Hayami, Sandler, Scherer, T. Smith, Solo, Strassmann, Tascher, Tokaty, Vincenti, Virginski (43 articles)
2. **Need to lobby for funding for development project (p. 46)**
   Dornberger, Flick, R. Hall, Pearson, Perry, Post (191), Sandler, T. Smith, Vincenti (9 articles)
3. **Military setting for development project (p. 46)**
   Dornberger, Frazier, R. Hall, Hewlett (103, 104), D. Jones, Krammer, Miles, Pearson, Perkins, Perry, Sandler, M. Smith, Tokaty (14 articles)
4. **Corporate setting for development project (p. 46)**
   Brittain (18), Bryant (21, 24), Chapin, Hills and Pacey, Howard, Hughes (112, 113), Jenkins, Jeremy, Leslie, Mayr (156), Robinson, Scherer, Wise (15 articles)
5. **Development as a goal-directed activity (pp. 46–49)**
   Bryant (21, 24), Chapin, Constant, Dornberger, Frazier, R. Hall, Hewlett (103, 104), Howard, Hughes (112, 113), Jenkins, Jeremy, Leslie, Mayr (156), Miles, Perry, Post (191), Robinson, Ruttan and Hayami, Scherer, T. Smith, Tokaty, Wise (25 articles)
6. **Nonthematic references to problems solved during development (p. 47)**
   DeWalt, Dorn, Hagan, Harris and Pris, Jensen and Rosegger, Jewett (122), D. Jones, Kraus, Nunis, Fulton and McCarthy, Pendray, Rasmussen, Roach, Tascher, Tucker, Virginski (15 articles)

3. Innovation

1. **Contrasts between innovation and invention (pp. 51–53)**
   Bryant (24), Constant, Hughes (114), Kohlmeyer and Herum, Layton (142, 143), Mayr (156), Robinson, Rürup, Scherer, Uselding (11 articles)
2. **Innovation as characterized by profit motive or market strategy (pp. 52–54)**
   A. Cost analysis, quantity production, standardization
      Clark, DeWalt, Dornberger, Feller, Harrison, Howard, Hughes (111, 113), Jenkins, Jensen and Rosegger, Jeremy, Jevons, Krammer, Layton (144), Massouh, Paterson, Post (191), Robinson, Rosenberg (211, 213), Scherer, Sinclair (225), Strassman, Uselding, Wik (264), Woodbury (26 articles)
   B. Corporate setting
      Bilstein, Bryant (21, 24), Chapin, Clark, Constant, Feller, Howard, Hughes (111, 113), Jenkins, Jeremy, Jevons, Jewett (122), Kohlmeyer and Herum, Krammer, Leslie, Loria, Massouh, Mayr (156), Multhauf (171), Paterson, Perkins, Robinson, Rosenberg (211, 213), Scherer, Sinclair (225), Strassman, Uselding, Wik (264), Woodbury (32 articles)
   C. Patent strategy
      Bryant (21), Chapin, Robinson, Wise (4 articles)
3. **Innovation as diffusion process (pp. 54–55)**
   Bilstein, Bryant (24), Burke (28), Clark, Constant, DeWalt, Feller, D. Jones, Harrison, Hughes (111), Kanefsky and Robey, Kohlmeyer and Herum, Krammer, Perkins, Reynolds, Rosenberg (211), Ruttan and Hayami, Sinclair (225), M. Smith, Tucker (20 articles)
4. **Nonanalytic verification of the diffusion of a specific technology (p. 55)**
   Bowles, Bray, Cowan (47), Fox, Kreutz, Muendel, Vanke, Virginski, Wik (264) (9 articles)

4. Technological Support Network

1. **Support network as a necessary condition for emerging technology (pp. 61–62)**
   Baranson, Bryant (24), Cardwell (37), Condit (43), Dalrymple (49), Daniels, Dornberger, Drucker (58), Finch, A. Hall, (93, 94), Hanieski, Heilbroner, Howard, Hughes (111, 113), Jewett (121), Kanefsky and Robey, Kerker, Kohlmeyer and Herum, Lieberstein, Miller, Multhauf (172), Post (191), Price (194), Pursell (196), Rae (200), Reynolds, Rosenberg (211), C. Smith (231), T. Smith, Spence, Tucker, Uselding, Usher (35 articles)
2. **Infrastructure as generating new technology (pp. 62–63)**
   Drucker (58), Krammer, Price (194), Rosenberg (213), Usher (5 articles)
3. **Infrastructure as related to emerging technology (no causal assertion) (p. 63)**
   Bilstein, Cain (33), Cardwell (36), Hewlett (103), Jeremy, Jewett (121), LaForce, Paterson, Ruttan and Hayami, Scherer, Sinclair (225), Solo, Vincenti, Welsh (258), Wik (264) (15 articles)
4. **Impact of new materials or techniques on support network (p. 63)**
   Dalrymple (49), Dornberger, Jewett (122), Leighton (146), Reynolds, Rosenberg (213), Skramstad, Uselding (8 articles)

5. **Impact of new artifact on support network (pp. 63–64)**
   Bilstein, Cain (33), R. Hunter, Massouh, McCutcheon, Sinclair (226), Wilkinson (265) (7 articles)

5. *Technical Tradition*

1. **Explicit definition of technical tradition (p. 64)**
   Constant, Hughes (114), Uselding, White (261) (4 articles)
2. **Tradition fostering incremental invention (p. 65)**
   Bray, Condit (45), DeWalt, Dryden, Feibleman (66), Frazier, Hacker (90), R. Hall, Howard, Jensen and Rosegger, Pearson, Price (193), Rae (201), Reynolds, Rosenberg (213), Sandler, Skramstad, Vincenti (18 articles)
3. **Tradition as background for breakthrough inventions (pp. 65–66)**
   Bryant (22), Condit (44), Constant, R. Hall, Hanieski, Jenkins, Kerker, Post (191), Uselding, Welsh (259), Wik (264), Woodbury (12 articles)
4. **Social mechanisms for transmission of knowledge in a tradition (pp. 66–67)**
   Bryant (21, 23), Cowan (48), DeWalt, Howard, Hughes (113), Mayo-Wells, Multhauf (172), Vincenti, Wik (264) (10 articles)
5. **Tradition as cumulative knowledge (p. 67)**
   Dalrymple (50), Mumford (175), Vincenti (3 articles)
6. **Tradition as hindrance to invention (p. 67)**
   Feibleman (66), Hilliard (2 articles)
7. **Verification of the influence of prior tradition on a specific invention (p. 67)**
   Bedini (9, 10), Bowles, Bray, Kren, Reti (204, 205), C. Smith (232), White (260, 261) (10 articles)
8. **Description of events in a tradition without analysis (p. 68)**
   Balmer, von Braun, Garcia-Diego, Hacker (89), Hoberman, Kilgour, Kraus, Mayr (155), Parr, Reti (205), Tascher (11 articles)
9. **Breakthrough inventions generating subsequent incremental inventions (p. 68)**
   Constant, R. Hall, Lienhard, Kerker (4 articles)
10. **Other references to impact on subsequent tradition (p. 68)**
    Condit (44), Layton (144), Leslie, Pearson, Pendray, Vogel, White (260) (7 articles)

6. *Systems*

1. **Explicit theory of systems (pp. 69–72)**
   Constant, Drucker (57), Hughes (112, 113), Mayr (155), Rosenberg (213), Strassman (7 articles)
2. **Single machine as system (p. 72)**
   Bryant (21, 23), Chapin, Constant, Feibleman (67), Hacker (89), Hanieski, Howard, Kraus, Leslie, Post (191), Scherer, Vincenti, White (261), Wik (264) (15 articles)
3. **Development project as system (pp. 72–73)**
   von Braun, Bryant (24), Dornberger, Hagen, R. Hall, Howard, Hughes (113), Leslie, Mayo-Wells, Miles, Perry, Rasmussen, T. Smith (13 articles)

A. Development case studies using "system" explicitly
R. Hall (p. 424), Miles (p. 482), Perry (p. 469) (3 articles)

4. **Production unit as system (pp. 73–75)**
Chapin, Fries, Harris and Pris, Hills and Pacey, Jenkins, Jeremy, Pursell (196), Robinson, Scherer, Sinclair (225), M. Smith, Uselding, Wilkinson (266) (13 articles)

5. **Transmission network as system (pp. 75–76)**
Agassi, Balmer, Bilstein, Brittain (18), Cain (32), Clark, Hounshell, Hughes (111, 112, 113), Jensen and Rosegger, Jewett (122), Massouh, Sinclair (226), Skramstad (15 articles)

6. **References to systems as standardized (pp. 75–76)**
Chapin, Clark, Drucker (57), Feller, Fries, A. Hall (94), Hills and Pacey, Jenkins, Jeremy, Kraus, Miles, Rasmussen, Rosenberg (211), Ruttan and Hayami, Sinclair (225), M. Smith, Strassmann, Uselding, Usher, Wilkinson (266) (20 articles)

7. **Sector of economy as system (pp. 76–78)**
Carver, Dalrymple (50), Gade, A. Hall (94), Hilliard, Kohlmeyer and Herum, Lieberstein, Rasmussen, Rosenberg (211, 213), Ruttan and Hayami, Schallenberg and Ault, Usher (13 articles)

8. **Impact of emerging technology on a system (p. 79)**
Burke (27), Rosenbloom, Rürup, Schallenberg and Ault (4 articles)

The Science vs. Technology Relationship (Chapter 3)

7. Statement 1: Scientific activity is motivated by curiosity, whereas technology is motivated by the desire to solve problems (pp. 86–87).

1. **Hypothesis as limited conclusion from a case study**
Dornberger, Hewlett (103), Scherer, T. Smith, Wise (5 articles)

2. **Hypothesis as a universal assumption**
Buchanan, Bunge, Mumford (177), Rae (200, 201), Skolimowski (6 articles)

3. **Explicit critique of the hypothesis**
Hughes (112), Meeker, Reingold, C. Smith (231) (4 articles)

8. Statement 2: The "desired artifact" in science is a theoretical model, whereas knowledge is in the service of the "desired artifact" of technology (pp. 87–90).

1. **Adoption of the hypothesis**
Agassi, Bryant (21, 23), Buchanan, Cardwell (36), Constant, Hacker (89), Hewlett (103, 104), Hughes (112), Layton (141, 142, 143, 144), Multhauf (171), Overfield, Price (194), Pursell (197), Rae (201), Reingold, Reynolds, Skolimowski, C. Smith (231, 232, 233), Vincenti (26 articles)

2. **Technological knowledge as theoretical**
Agassi, Bryant (21, 23), Constant, Hughes (112), Jewett (121, 122), Layton (141, 142, 143), Overfield, Price (194), Pursell (197), Reingold, Skolimowski (15 articles)

3. **Technological knowledge as empirical**
   Hacker (89), Multhauf (171), C. Smith (231, 232, 233) (5 articles)

9. Statement 3: Science fosters technological creativity and rationalizes existing technological practice (pp. 90–91)

1. **Case studies: science as necessary condition for inventive insight**
   Brittain (18), Constant, Fox, Hewlett (103, 104), Kerker, Reynolds, Scherer, T. Smith (9 articles)
2. **Case studies: science governs development processes**
   Bryant (23, 24), Hughes (112), Loria, Mayr (156), Multhauf (172), Paterson, Rosenberg (211, 212) (articles)
3. **Case studies: science rationalizes existing technological practice**
   Condit (43, 45), Multhauf (171, 172, 174), Overfield, Rae (201), Rezneck, Tobey (9 articles)
4. **General theory**
   Bunge, Feibleman (66, 67), Gilfillan, A. Hall (94), Kevles (132), Kohlmeyer and Herum, Leicester, Rürup, Watson-Watt, Zvorikine (271, 272) (12 articles)

10. Statement 4: Technology contributes to science by creating instruments, by posing scientific problems, and by creating conceptual models for later science (pp. 92–93)

1. **Technology creates instruments for science**
   Bedini (10), von Braun, Burlingame (30), Dryden, Feibleman (66), Hagen, Mayo-Wells (7 articles)
2. **Technology poses problems for science**
   Bryant (21, 24), Bunge, Feibleman (66), Finch, Kerker, Layton (141), Rae (200, 201), C. Smith (231, 232) (11 articles)
3. **Technology creates conceptual models for science**
   Buchanan, Cardwell (36), Fryer and Marshall, Kerker, Mayr (155) (5 articles)

11. Statement 5: Scientific and technological activities that occur in human communities often influence science-technology interactions (pp. 93–94)

1. **Communities with clearly defined boundaries**
   Cardwell (37), Kerker, Layton (141, 142), Price (194) (5 articles)
2. **Communities with unclear boundaries**
   Fullmer, Jensen and Rosegger, Kevles (132), Multhauf (169, 174), Overfield, Post (192), Pursell (197), Reingold, Reynolds, Robinson (in discussion of Hughes [112]), Wise (12 references)

12. Statement 6: Technology is applied science (pp. 96–99)

1. **Use of the expression "applied science"**
   Bunge, Feibleman (66, 67), Heilbroner, Kevles (132), Leicester, Morris, Pursell (199), Rae (200), Watson-Watt (10 articles)

2. **Historical transition from "craft" to "exact science"**
   Bunge, Condit (43), A. Hall (94), Lienhard, Leicester, Heilbroner, Rürup (7 articles)
3. **Science as the sole source of knowledge in modern technology**
   Bunge, Feibleman (66), A. Hall (94), Leicester, Rae (200, 201), Rürup, Zvorikine (271, 272) (9 articles)

13. Statement 7: Technology is not applied science (pp. 99–103)

1. **Explicit critiques of the applied science hypothesis**
   Cardwell (36), Drucker (58), Hughes (112, 114), Jevons, Layton (141, 142, 143), Multhauf (174), Skolimowski, T. Smith, Thomas (12 articles)

Characteristics of Technological Knowledge (Chapter 3)

14. Scientific concepts

1. **Scientific concepts appropriated by technology and restructured according to its purposes (pp. 103–105).**
   Agassi, Bryant (23, 24), Fullmer, Hagen, Hewlett (104), Hoberman, Hughes (112), Kerker, Layton (141, 142, 143, 144), Mayr (156), Multhauf (174), Perkins, Perry, Price (194), Reynolds, Skolimowski, T. Smith, Strassman, Tobey, Usher, Wise (25 articles)

15. Problematic data

1. **Need for data in cases of emerging technology (p. 106)**
   Brittain (18), Bryant (23, 24), Clark, Cardwell (37), Dalrymple (50), Hacker (89), Hewlett (103, 104), Hoberman, Hounshell, Hughes (112), Jewett (122), Layton (144), Leslie, Mark, Abel, and Chiu, Mayr (156), Multhauf (172), Paterson, Perkins, Reynolds, Sinclair (115), Tascher, Vincenti (24 articles)
2. **Need for data due to problems occurring in normal use (pp. 106–107)**
   Burke (27), Cain (32, 33), Flick, Fullmer, Hills and Pacey, Jeremy, Layton (141), Mark, Abel, and Chiu, Multhauf (171, 172, 174), Overfield, Parr, Paterson, Reingold, Rezneck, Rosenberg (212), Sinclair (225), Skramstad, C. Smith (231, 232, 233), Znachko-Iavorskii (24 articles)
3. **Data search institutionalized in testing facilities (p. 107)**
   Burke (27), Hanieski, Jeremy, Kevles (132), Leslie, Paterson, Pursell (197), Reingold, Rezneck, Sinclair (225), Vincenti (11 articles)

16. Engineering Theory

1. **General description: formal experimental theory about artifacts (pp. 107–109)**
   Balmer, Brittain (18), Brittain and McMath, Bryant (23, 24), Cardwell (37), Condit (43, 44, 45), Constant, Finch, Garcia-Diego, Hacker (89), Hanieski, Hughes (112, 113), R. Hunter, Jewett (122), Kevles (131), Kohlmeyer and Herum, Layton (141, 142, 143, 144), Lieberstein, Mayr (156), Multhauf (172), Post (191), Reingold, Robinson, Rürup, Sinclair (225), Skolimowski, C. Smith (231), T. Smith, Tucker, Vincenti (37 articles)

2. **Engineering theory in cases of emerging technology (pp. 109–110)**
   Brittain (18), Bryant (24), Constant, Hanieski, Harrison, Hughes (112, 113), Layton (144), Mayr (156), Multhauf (172), Post (191), Reynolds, Robinson, Sinclair (225), T. Smith, Tucker, Vincenti (17 articles)
3. **Institutional base for engineering theory (pp. 110–113)**
   Brittain and McMath, Hughes (112, 113), Kevles (132), Kohlmeyer and Herum, Layton (141, 142), Lieberstein, Mayr (156), Multhauf (172), Price (194), Pursell (198), Reingold, Sinclair (226), T. Smith, Vincenti (16 articles)
4. **Engineering theory contrasted with technical skill (pp. 113–114)**
   Brittain and McMath, Bryant (23), Cardwell (37), Condit (44), Dorn, Finch, Garcia-Diego, A. Hall (93), R. Hunter, Jewett (122), Multhauf (172), Post (191), Sinclair (225) (13 articles)

17. Technical skill

1. **Skill as learned experientially (pp. 113–116)**
   A. Skill as intimacy
      Feibleman (67), C. Smith (233) (2 articles)
   B. General descriptions of skill
      Balmer, Brittain and McMath, Bryant (23), Cain (33), Claxton, DeWalt, Dorn, Dornberger, Feibleman (66, 67), Finch, Garcia-Diego, A. Hall (93), Hewlett (104), Hughes (114), Jensen and Rosegger, Jeremy, Layton (141), Leslie, Lieberstein, Mássouh, Mayr (156), Morris, Paterson, Reynolds, Rosenberg (211), Rürup, C. Smith (231, 233), Vincenti (30 articles)
2. **Skilled labor (pp. 116–118)**
   A. Needed in a technical process
      Baranson, Boyer, Brittain and McMath, Brown, Burns, Dornberger, Feibleman (67), Finch, Garcia-Diego, Glick, Howard, Jensen and Rosegger, LaForce, Lieberstein, Pursell (198), Rosenberg, (211, 213), Simms, M. Smith, Solo, Strassman, Welsh (258), Wilkinson (265) (23 articles)
   B. Replaced by machines or standardized processes
      Clark, Cowan (47), Esper, Feller, Fries, Harris and Pris, Jenkins, Jeremy, Packer, Pursell (196), Rasmussen, Rosenbloom, Sinclair (225), M. Smith, Welsh (259), Wilkinson (266) (16 articles)
   C. Attention to labor-management tension over replacement of skilled labor by machines
      Brown, DeWalt, Harris and Pris, D. Jones, Krammer, Pursell (196), Rosenbloom, Thomas (8 articles)
3. **Skill generates nontheoretical rules for praxis (pp. 118–119)**
   Brittain and McMath, Bryant (23, 24), Burns, Cain (33), Dornberger, Edelstein, Feibleman (66, 67), Finch, Garcia-Diego, A. Hall (93, 94), Hewlett (104), Hills and Pacey, R. Hunter, Jeremy, Layton (143), Massouh, Multhauf (172, 174), Packer, Parr, Post (191), Rosenberg (211), Rürup, Sharrer, Sinclair (225), C. Smith (231), Uselding, Welsh (258) (31 articles)
4. **Skill codified in simple mathematical formulas (p. 119)**
   Burns, Drucker (57), Glick, Hacker (89), Kahn, Layton (141), Mayr (155), Shelby, Simms (9 articles)

Technology and Its Cultural Ambience (Chapter 4)

18. Technology transfer

1. Verification of specific transfers (pp. 123–124)

A. Verification as the central focus
Bachrach (3), Fox, Roland, Tokaty, Virginski, Wilkinson (265) (6 articles)

B. Verification included but not as central focus
Balmer, Bedini (10), Bowles, Burke (28), Dalrymple (50), Ferguson (71), Garcia-Diego, Harris and Pris, Jewett (121), Kren, Kreutz, Muendel, Multhauf (171), Puhvel, Sleeswyk, White (260, 261), Woodbury (18 articles)

2. Vehicles of technology transfer (p. 124)

A. Theoretical models of transfer
Feller, Rosenberg (211), Ruttan and Hayami, Woodruff and Woodruff (4 articles)

B. Skilled personnel as vehicle
Brown, Cain (33), Daniels, Drucker (59), Feller, Gorman, R. Hunter, Layton (141), Loria, Rezneck, M. Smith, Virginski, Wilkinson (265) (13 articles)

C. Journals, exhibitions, schools as vehicles
Carver, Ferguson (69), Frazier, Rezneck, Roland, Sinclair (225), Skramstad, Woodbury (8 articles)

D. Formal agreements as vehicle
Dalrymple (49), Dorn, Fries, Hacker (91), Hughes (111), Krammer, Kraus, LaForce, Loria, Pursell (196) (10 articles)

E. Colonial policy as vehicle
Gade, Gorman, Hoberman, Jensen and Rosegger, Leighton (146), McCutcheon, Woodruff and Woodruff (7 articles)

F. Espionage as vehicle
Jeremy, Wilkinson (265) (2 articles)

3. Transfer and technological support network (pp. 124–128)

A. Theoretical models
Baranson, Calder, Drucker (59), Goldschmidt, Rosenberg (211), Ruttan and Hayami, Shriver, Theobald, Woodruff and Woodruff (9 articles)

B. Case studies focused on transfer
Brown, Dalrymple (49), Dorn, Feller, Fries, Hacker (91), Hoberman, Hughes (111), Jensen and Rosegger, LaForce, McCutcheon, Nicholas, Pursell (196), Wilkinson (265) (14 articles)

C. Peripheral references
Brittain and McMath, Carver, Daniels, DeWalt, Gade, Gorman, R. Hunter, Jeremy, Jewett (121), Kraus, Leighton (146), Loria, Mayr (156), Rosenberg (211, 212, 213), Rürup, Sinclair (225, 226), Skramstad, C. Smith (232), Tokaty (22 articles)

4. Transfer and Culture (pp. 128–134)

A. Technology as culturally neutral
Goldschmidt, LaForce, Morris, Rürup (4 articles)

B. Prescriptive articles calling for respect of cultural values
Baranson, Calder, Drucker (59), Shriver, Theobald (5 articles)

C. Case studies focused on transfer and culture
Brown, Dorn, Fries, Jensen and Rosegger, Hacker (91), Hughes (111), Sinclair (226) (7 articles)

D. Peripheral references to transfer and culture
Bilstein, Brittain and McMath, Dalrymple (49), DeWalt, Gorman, D. Jones, Hughes (114), LaForce, Pursell (196), Rosenberg (212), Ruttan and Hayami, Welsh (258) (12 articles)

19. Technological determinism

1. Split of efficiency norm from cultural norms (pp. 136–139)

A. Critiques
Buchanan, Clarke, Ellul, Ferguson (70), Hartner, Meeker, Morris, Mumford (175), Pursell (199) (9 articles)

B. Example of the position
Feibleman (67), Lienhard, Usher (3 articles)

2. Fixed sequence of technological progress (pp. 140–143)

A. Critiques
Durbin, Ferguson (70), Joravsky, Hughes (114), Rürup, Shriver, Thomas, White (261) (8 articles)

B. Example of the position
Burlingame (30), Heilbroner, Lienhard, Mesthene (162, 163), Price (193, 194), Watson-Watt, Zvorikine (271, 272) (10 articles)

3. Society must adapt to technological change (pp. 143–145)

A. Critiques
Ellul, Daniels, Pursell (199), Thomas (4 articles)

B. Examples of the position
Allen, Burlingame (30), Howland, Mesthene (162, 163), Price (194), Watson-Watt (7 articles)

4. Success-story format (pp. 145–146)

A. Critiques
Ferguson (70, 71), L. Hunter, H. M. Jones, Post (191), Rürup (6 articles)

B. Failure studies
Brown, Hoberman, L. Hunter, Jensen and Rosegger, Perkins, Post (191), Tascher (7 articles)

5. Western dominance (pp. 146–148)

A. Critiques
Buchanan, DeWalt, Ellul, Hartner, Rürup, Woodruff and Woodruff (6 articles)

B. Examples of the position
Brown, Burlingame (30), Heilbroner, Howland, Mesthene (162, 163), Watson-Watt (7 articles)

20. Technological momentum

1. Explicit use of "momentum" or "inertia" (pp. 149–154)
Bailes, Ferguson (70), Hounshell, Hughes (111), Kevles (132), Rosenbloom, T. Smith (7 articles)

2. **Unforeseen consequences of technology (p. 148 n. 55)**
   Ellul, Layton (141), Mesthene (162, 164), Pursell (199), Rosenberg (212), Rosenbloom, Rürup, Susskind and Inouye (9 articles)
3. **Enduring nature of existing technical concepts (pp. 155–156)**
   Bryant (22, 23), Cardwell (36, 37), Constant, Cowan (48), Fullmer, Harrison, Hilliard, Hoberman, Hounshell, Howard, Hughes (112), Jenkens, Kerker, Layton (144), Leslie, Mayr (156), Perkins, Reynolds, Sandler, Sinclair (226), Usher, Vincenti, Welsh (258), Wik (264) (26 articles)
4. **Enduring nature of existing technological artifacts (pp. 156–157)**
   Cain (33), Feller, Fries, Gade, Howard, Hughes (113), L. Hunter, Jensen and Rosegger, McCutcheon, Schallenberg and Ault, Sinclair (225), Tucker, Wilkinson (266), Znachko-Iavorskii (14 articles)
5. **Enduring nature of governmental policy (p. 157)**
   Bailes, Burke (27), Carver, Dorn, Hagen, Hughes (111), D. Jones, Perkins, Perry, Pursell (199), T. Smith, Tucker (12 articles)
6. **Enduring nature of corporate vested interests (pp. 157–158)**
   Bilstein, Burke (27, 28), Chapin, Clark, Dorn, Feller, Flick, Hoberman, Hounshell, Jeremy, Krammer, Leslie, Nicholas, Pursell (199), Rosenberg (211), Scherer, Sinclair (226), Strassmann, Wise (20 articles)
7. **Enduring nature of technological enthusiasm (p. 158)**
   Clarke, Feibleman, Ferguson (70), Hagen, Jensen and Rosegger, D. Jones, Kevles (132), Leslie, Perkins, T. Smith (10 articles)
8. **Enduring nature of cultural values (pp. 158–161)**
   Allen, Cowan (48), Dalrymple (49), Daniels, DeWalt, Drucker (59), Durbin, Esper, Feibleman (67), Fries, Gade, Hacker (91), Hagen, D. Jones, H. Jones, LaForce, Leighton (146), Lieberstein, Loria, Morris, Mumford (178), Pearson, Perry, Post (191), Pursell (199), Rosenbloom, Sandler, Shriver, Sinclair (226), Skolimowski, Susskind and Inouye, Tascher, Welsh (258), Uselding (34 articles)

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21. Questions seldom discussed

1. **Failure studies (pp. 175–176)**
   A. Articles calling for failure studies
      Ferguson (70), L. Hunter, H. Jones, Post (191), Rürup (5 articles)
   B. Failures within longer successful traditions
      Bailes, Burke (27), Dalrymple (50), Feller, Frazier, Fries, Hughes (111), L. Hunter, Pearson, Post (191), Tascher, Woodbury (12 articles)
   C. Disappearance of or noninvestment in a technology
      Esper, Flick, Kevles (132), Leslie, Perkins, Tucker (6 articles)
   D. Miscellaneous perspectives
      Cowan (48), Jensen and Rosegger, Thomas (3 articles)
2. **Worker perspective (pp. 176–177)**

A. References to worker tensions
Brittain and McMath, Cowan (47), Dalrymple (49), Gorman, D. Jones, Mayr (155), Pursell (196, 199), Rasmussen, Susskind and Inouye, Thomas (11 articles)

B. Omission of worker perspective
Clark, Feibleman (67), Harris and Pris, Jeremy, Welsh (259), Wilkinson (266) (6 articles

3. Culture conflict in technology transfer (pp. 177–178)

A. References to colonialism
Brown, Gade, Gorman, Hoberman, Jensen and Rosegger, Leighton (146), McCutcheon (7 articles)

4. Studies of non-Western technologies (pp. 178–179)

A. Individual studies
Bray, DeWalt, Frankel, Sleeswyk, Sun, Wachsmann and Kay (6 articles)

B. Multiperiod surveys
Calder, Dresbeck, Fox, Kreutz, C. Smith (232, 233), White (261), Znachko-Iavorskii (8 articles)

5. Critiques of capitalism (pp. 179–180)

A. References to capitalist assumption in historical articles
Burke (27, 28), Dorn, Mayr (155), Thomas (5 articles)

B. Nonhistorical essays discussing premises of capitalism
Buchanan, Clarke, Durbin, Ellul, Hartner, Heilbroner, Mumford (176, 178), Rosenbloom, Shriver (10 articles)

6. Women and technology (p. 180)

Cowan (47, 48), Vanek (3 articles)

Notes

Chapter 1

1. Melvin Kranzberg to John Staudenmaier, 4 March 1983.

2. The brevity of my coverage of the "contextual" history of SHOT and TC is not due to a lack of appreciation for the sociological study of an emerging disipline. For the reasons mentioned in the introduction I am primarily interested in the new historical language that a careful text analysis finds in TC's articles. The reader may wish to consult my more detailed treatment of SHOT's institutional history in the dissertation from which this work has grown, "Design and Ambience: Historians and Technology: 1958–1977" (1980).

Some of the original dissertation and a number of its appendixes are not reproduced here. For reference the following list may be helpful. Appendix 1 focuses on TC's author constituency, including (1) a table listing by year all contributions to TC by author from 1959 to 1977; (2) a table listing each author's professional self-identification and country of residence; and (3) author responses to selected questions (personal interviews and questionnaire) about TC and the history of technology generally. Appendix 2 treats SHOT's relationships with other academic and technical societies: (1) joint sessions, at SHOT annual meetings, with other academic and technical societies through 1976; (2) SHOT joint sessions with other societies apart from annual meetings through 1970. Appendix 3 covers SHOT's membership growth from 1959 through 1976, and appendix 4 the society's outside sources of funding through 1976. Appendix 5 is a list of SHOT award winners—the Dexter, Usher, and Leonardo da Vinci prizes—through 1977.

All further citations of books and articles will be by short title, and the society and the journal will be referred to by their customary acronyms, SHOT and TC. Full citations may be found in the bibliography.

3. Most if not all of the early financial support was raised by Kranzberg. His relationship with the Kaufmann Foundation, by far SHOT's major source, is illustrative.

"I went to New York City and spoke with Edgar Kaufmann, Jr. (whose membership in SHOT dated back to 1960), and in 1964 the Foundation gave us $2,500. Although that enabled us to take care of our 1963 deficit, the deficits continued. In 1965, I approached Ed Kaufmann again because we had a $3,194.10 deficit for publication of our 1964 volume—and we anticipated further deficits for the next two or three years, since we had shifted to the University of Chicago Press from the Wayne State University Press. Taking a hint from Kaufmann, I applied for a three-year grant of