claims these authors make about scientific change, but only those claims that contrast most clearly with those of our primary authors.

7.1. *Guiding Assumptions*[5]

(1) Science is a form of research utilizing sets of guiding assumptions. ⟨Kuhn 1970: 4–5; Lakatos 1978: 34, 47; Laudan 1977: 71–2⟩
(2) Sets of guiding assumptions:
  (2.1) are constellations of beliefs, values and techniques shared by a community. ⟨Kuhn 1970: 175–76; 1977: 294⟩
  (2.2) are embodied in specific achievements that serve as models for solving new problems. ⟨Kuhn 1970: 10, 43, 188–89; 1977: 284, 301, 306, 313–14, 319⟩
  (2.3) provide criteria for the adequacy of problem solutions. ⟨Laudan 1977: 25; Lakatos 1978: 47, 50, 88⟩
  (2.4) provide explicit guidelines for modifying and transforming theories so as to improve their problem-solving effectiveness. ⟨Laudan 1977: 79, 92; Lakatos 1978: 47–50, 88⟩
  (2.5) are specifications of the kinds of objects and processes in a domain, the methods suitable for studying them, and a set of cognitive aims. ⟨Laudan 1977: 79; 1984: 42; Kuhn 1970: 4–5⟩
  (2.6) identify problems which thereby become the only important problems in a domain. ⟨Lakatos 1978: 38, 65, 127–28⟩
  (2.7) are unclear at the outset and remain so for a long time. ⟨Feyerabend 1975: 177⟩
  (2.8) are explicit at the outset. ⟨Lakatos 1978: 47–50; Laudan 1977: 86⟩
  (2.9) are almost never explicit. ⟨Kuhn 1970: 42, 46, 49; Fleck 1979: 41⟩
  (2.10) have stable mathematical cores that are held immune from refutation. ⟨Stegmueller 1976: 215⟩
  (2.11) have central elements which are held immune from refutation and which never change until the entire set is abandoned. ⟨Lakatos 1978: 47–50, 88; Kuhn 1970: 34⟩

  (2.12) have central elements which sometimes change in piecemeal fashion. ⟨Laudan 1977: 99; 1984: 73⟩
  (2.13) have central ideas that may be transformed almost beyond recognition ⟨Cohen 1985: 35⟩
  (2.14) are wholly displaced during a revolution. ⟨Kuhn 1970: 92; 1981: 5, 23⟩
  (2.15) include elements which:
    (a) show that a theory can solve a problem before it actually has solved it. ⟨Kuhn 1977: 301; Laudan 1977: 43⟩
    (b) give directions for modifying theories to make them better problem solvers. ⟨Laudan 1977: 92; Lakatos 1978: 51–2, 63, 65⟩
    (c) direct the solving of new problems by modelling them on old problems. ⟨Kuhn 1970: 189–90, 200; 1977: 270, 305–7⟩
    (d) give directions for replacing theories in the absence of empirical problems. ⟨Lakatos 1978: 65; Laudan 1977: 47, 88⟩
(3) The acceptability of a set of guiding assumptions is judged largely on the basis of:
  (3.1) empirical accuracy. ⟨Kuhn 1977: 323⟩
  (3.2) factors other than empirical accuracy. ⟨Lakatos 1978: 39, 65, 69, 185; Laudan 1977: 68, 107; Kuhn 1977: 199, 22⟩
  (3.3) the success of its associated theories at solving problems. ⟨Laudan 1977: 82, 124⟩
  (3.4) the success of its associated theories at making novel predictions. ⟨Lakatos 1978: 185–86⟩
  (3.5) its ability to solve problems outside the domain of its initial success. ⟨Kuhn 1970: 206, 208; 1977: 322; Lakatos 1978: 39, 69⟩
  (3.6) its ability to make successful predictions using its central assumptions rather than assumptions invented for the purpose at hand. ⟨Lakatos 1978: 185–86⟩
  (3.7) factors other than simplicity. ⟨Kuhn 1977: 324; Lakatos, 1978: 129⟩
  (3.8) aesthetic criteria. ⟨Kuhn 1970: 158⟩
  (3.9) factors other than consistency. ⟨Lakatos 1978: 58⟩

  (3.10) its relation to other well-established beliefs. ⟨Kuhn 1977: 22–3; Laudan 1977: 50–4; Fleck 1979: 9⟩
  (3.11) its relation to nonscientific beliefs. ⟨Kuhn 1970: 199; Laudan 1977: 61–4; Feyerabend 1981a: 60⟩
  (3.12) factors other than its practical applications. ⟨Kuhn 1970: 69⟩
(4) During, and *only during*, periods of agreement about guiding assumptions:
  (4.1) there is consensus about what is in the world, about how the world interacts with our senses, about types of instrumentation, and about the criteria for acceptable solutions and for choosing research problems. ⟨Kuhn 1970: 64–5, 37–41; 1977: 277; Feyerabend 1970: 179⟩
  (4.2) scientists do not aim to produce novel theories or facts, but science nonetheless produces them. ⟨Kuhn 1970: 24, 35, 52, 64, 169⟩
  (4.3) scientists always aim to produce novel facts. ⟨Popper 1963: 241; Lakatos 1978: 36, 52⟩
  (4.4) the primary unit of publication is the research article. ⟨Kuhn 1970: 20–1⟩
  (4.5) scientists attempt to simplify formulae. ⟨Kuhn 1977, 300⟩
  (4.6) this agreement is universal, involving virtually all scientists in the community. ⟨Kuhn 1970: 183–5; 1977: 321, 329⟩
  (4.7) communication between scientists is largely successful. ⟨Kuhn 1970: 182; 1977: 297⟩
(5) Acceptance of a dominant set of guiding assumptions begins to break down when:
  (5.1) *persistent* empirical difficulties arise. ⟨Kuhn 1970: 69⟩
  (5.2) a few scientists sense that the dominant guiding assumptions are no longer functioning adequately (are failing to predict novel phenomena). ⟨Kuhn 1970: 92; 1977: 281⟩
(6) When a set of guiding assumptions runs into empirical difficulties:
  (6.1) scientists believe this reflects adversely on their skill

rather than on inadequacies in the guiding assumptions ⟨Kuhn1970: 35, 80; 1977: 362–3⟩
  (6.2) scientists are prepared to leave the difficulties unresolved for years. ⟨Kuhn 1970: 81; Fleck 1979: 30–1⟩
  (6.3) scientists often refuse to change those assumptions. ⟨Kuhn 1977: 288; Lakatos 1978: 111, 126, 128⟩
  (6.4) scientists ignore the difficulties as long as the guiding assumptions continue to anticipate novel phenomena successfully. ⟨Lakatos 1978: 111, 126⟩
  (6.5) scientists believe that those difficulties become grounds for rejecting the guiding assumptions only if they persistently resist solution. ⟨Kuhn 1970: 69; 1977: 272; Lakatos 1978: 16, 72, 76, 86, 111⟩
  (6.6) scientists often introduce hypotheses which are not testable in order to save the guiding assumptions. ⟨Lakatos 1978: 126⟩
(7) Any set of guiding assumptions can be made to appear empirically successful, so long as enough clever scientists work on it. ⟨Lakatos 1978: 111; Feyerabend 1975: 153–4, 157⟩
(8) Competition among sets of guiding assumptions:
  (8.1) is the exception rather than the rule. ⟨Kuhn 1970: 178⟩
  (8.2) is the rule rather than the exception. ⟨Lakatos 1978: 69; Laudan 1977: 74; Feyerabend 1981b: 142, 145⟩
  (8.3) gives rise to periods of rivalry that alternate with periods of consensus about guiding assumptions. ⟨Kuhn 1970: 92–4⟩
  (8.4) gives rise to persistent competition that is unabated by lengthy periods of consensus. ⟨Feyerabend 1981b: 142; Laudan; Lakatos⟩
(9) Competing sets of guiding assumptions:
  (9.1) are often used simultaneously in scientific research. ⟨Lakatos 1978: 112; Laudan 1977: 110⟩
  (9.2) are often, as with wave and particle optics, polar opposites. ⟨Holton 1973; 99⟩
(10) A set of guiding assumptions is never rejected unless an alternative set is available. ⟨Kuhn 1970: 77, 79, 145, 147; 1977: 272; Lakatos 1978: 69, 72, 111; Laudan 1977: 71, 109; Feyerabend⟩
(11) New sets of guiding assumptions:

(11.1) are introduced only when the adequacy of the prevailing set has already been brought into question. ⟨Kuhn 1970: 67, 74–5, 97; 1977: 235; 1963: 349, 365⟩
(11.2) explain all the phenomena explained by the older set. ⟨Lakatos 1978: 39, 69⟩
(11.3) often fail to be more accurate empirically than the earlier set. ⟨Kuhn 1977: 323⟩
(11.4) often lead to the abandonment of extra-scientific world views with which they are incompatible. ⟨Laudan 1977: 101⟩
(11.5) have striking confirmations before they run into empirical difficulties. ⟨Fleck 1979: 9, 28–9⟩
(11.6) are suggested long before a good rationale has been provided for them. ⟨Fleck 1979: 9; Kuhn 1970: 156, 158; Feyerabend 1981b: 141⟩
(11.7) are frequently accepted, but rarely explicitly argued for, on aesthetic grounds. ⟨Kuhn 1970: 155–56, 158⟩
(11.8) seldom initially solve more than a few problems, and those only imperfectly. ⟨Kuhn 1970: 156⟩
(11.9) are widely perceived to be faced with numerous apparent difficulties. ⟨Lakatos 1978: 37, 126, 128; Laudan 1977: 17–18; Feyerabend 1976: 55, 58, 65, 66; 1981a: 106; Kuhn 1970: 80⟩
(11.10) frequently lead to a reinterpretation of the evidence previously thought to support a predecessor. ⟨Feyerabend 1981a: 61⟩
(11.11) are suggested and seriously explored long before they succeed in overcoming the older guiding assumptions. ⟨Feyerabend 1981b: 141; Laudan 1977: 150–1⟩
(11.12) are suggested but ignored long before the older guiding assumptions are perceived to be in difficulty. ⟨Kuhn 1970: 24, 75⟩
(11.13) are developed, accepted and exploited before apparently decisive arguments for them have been advanced. ⟨Kuhn 1970: 156, 158; Feyerabend⟩
(11.14) are judged by yardsticks different from those used for well-established theories. ⟨Kuhn 1970: 156; Laudan 1977: 110; Feyerabend 1975: 183⟩
(11.15) are thought worthy of investigation largely because of

factors external to science. ⟨Toulmin 1967: 463⟩
(11.16) have core mathematical structures immediately in place. ⟨Stegmueller 1978: 219⟩
(12) A successor set of guiding assumptions:
(12.1) seldom accommodates all its predecessor's explanatory successes. ⟨Kuhn 1970: 167; Feyerabend; Laudan 1977: 17⟩
(12.2) always accommodates all its predecessor's explanatory successes. ⟨Popper 1959: 121–22; 1963: 241–42; Lakatos 1978: 32, 39, 69⟩
(12.3) is rarely as general as its predecessor. ⟨Feyerabend 1975: 176⟩
(12.4) is always more general than its predecessor. ⟨Popper 1959: 276; 1963: 241; Lakatos 1978: 32⟩
(12.5) is rarely as precise as its predecessor. ⟨Kuhn 1977: 323⟩
(12.6) is always as precise as its predecessor. ⟨Kuhn 1977: 320⟩
(12.7) seldom accommodates all its predecessor's solved empirical problems. ⟨Laudan 1977: 17⟩
(12.8) always accommodates all its predecessor's solved empirical problems. ⟨Lakatos 1978: 32; Kuhn 1977: 320⟩
(12.9) seldom solves all its predecessor's anomalies. ⟨Laudan 1977: 140; Feyerabend 1975: 29, 39, 41; 1981b: 142–4⟩
(12.10) always solves some of its predecessor's anomalies. ⟨Lakatos 1978: 39⟩
(12.11) seldom accommodates all its predecessor's observational consequences. ⟨Kuhn 1970: 114–15, 167⟩
(12.12) always accommodates all its predecessor's observational consequences. ⟨Popper 1959: 121–22⟩
(12.13) seldom accommodates all its predecessor's confirmed predictions. ⟨Lakatos 1978: 39, 69⟩
(12.14) always accommodates all its predecessor's confirmed predictions. ⟨Lakatos 1978: 32⟩
(12.15) seldom subsumes all its predecessor's putative laws of nature. ⟨Popper 1972: 198⟩
(13) Proponents of different sets of guiding assumptions:

(13.1) have different meanings for the everyday and observational terms used in the field. ⟨Feyerabend 1981a: 45; Popper 1958: 128; Kuhn 1970: 101, 111–12, 118–19⟩
(13.2) do not communicate fully since they have different problems and standards for solution and they employ similar language and experiments in different ways. ⟨Kuhn 1970: 109, 147–49; Feyerabend 1981a: 66⟩
(13.3) do not fully agree about which are the most important problems to solve. ⟨Kuhn 1970: 110; Laudan 1977: 40⟩
(13.4) think that the same instruments, manipulations and measurements reveal different things about nature. ⟨Kuhn 1970: 129–30, 134⟩
(13.5) think that the books and articles of the rival set are not fit for scientific study. ⟨Kuhn 1970: 167⟩
(13.6) often think that exemplars are related to each other in different ways. ⟨Kuhn 1970: 200, 285; 1981: 26⟩
(13.7) have different problems and different standards of solutions. ⟨Kuhn 1970: 92, 103, 106, 108, 109⟩
(13.8) view the world through different conceptual spectacles. ⟨Kuhn 1970: 102; Feyerabend 1981a: 55⟩
(14) Disputes about guiding assumptions:
(14.1) occur constantly. ⟨Feyerabend 1981b: 142; Lakatos 1978: 69; Laudan 1977: 74⟩
(14.2) occur infrequently. ⟨Kuhn 1970: 91; 1977, 273⟩
(15) Scientists usually switch from one set of guiding assumptions to a new set:
(15.1) within a decade or so of the recognition of acute empirical difficulties with the older set. ⟨Kuhn 1970: 75⟩
(15.2) with a few members of the community shifting at first, and then increasing allegiance by all but a few elderly hold outs. ⟨Kuhn 1970: 158, 159; Toulmin 1967: 469⟩
(15.3) because of the propaganda of the advocates of the new set, not for good reasons. ⟨Feyerabend 1975: 142–43, 153–54; 1970: 302⟩
(15.4) sometimes even in the absence of empirical testing. ⟨Kuhn 1977: 277; Lakatos 1978: 65; Laudan 1977:

47, 88⟩
(15.5) for reasons that vary from scientist to scientist. ⟨Kuhn 1977: 329, 333; Laudan 1984: 68; Holton⟩
(16) During a change in guiding assumptions (i.e., a scientific revolution):
(16.1) scientists disagree about guiding assumptions, disagreements that are heightened by a proliferation of rival theories, increased emphasis on empirical difficulties, concentration on areas of theoretical inadequacy, and scrutiny of philosophical foundations. ⟨Kuhn 1970: 5, 82–3, 86–8, 91; 1963: 367⟩
(16.2) the scientific community fragments. ⟨Kuhn 1970: 94⟩
(16.3) scientists fail to communicate. ⟨Kuhn 1970: 109, 147–49⟩
(16.4) a few scientists accept a new set of guiding assumptions which fosters rapid change, but resistance intensifies when change appears imminent. ⟨Feyerabend 1981b, 146–47; Laudan 1977: 137; Cohen 1985: 35⟩
(16.5) guiding assumptions change abruptly and totally. ⟨Kuhn 1970: 92, 103, 106, 108–9, 147–49, 150–151; Stegmueller 1978: 243⟩
(16.6) guiding assumptions do not change abruptly and totally. ⟨Laudan 1984: 76, 80, 86; Toulmin 1967: 67⟩
(16.7) the entire scientific community changes its allegiance to the new guiding assumptions. ⟨Kuhn 1970: 166–67⟩
(16.8) specific theories may remain unchanged. ⟨Kuhn 1977: 267; Laudan 1977: 96⟩
(16.9) theories may be abandoned, even though successful in accounting for entities thought to exist under the previous guiding assumptions. ⟨Laudan 1984: 113–14⟩
(16.10) a field's guiding assumptions may sometimes be replaced without contention. ⟨Kuhn 1970: 181⟩
(16.11) four successive stages can be distinguished: the formulation of the new set of guiding assumptions by a small group; the committment to those assumptions; the dissemination to the wider scientific world; and the conversion of a significant number of scientists. ⟨Cohen 1985: 28–32⟩
(17) Scientists often characterize recent scientific revolutions in their field:

(17.1) as if the new assumptions could solve all the outstanding problems that brought the previous guiding assumptions into question. ⟨Kuhn 1970: 153, 169⟩
(17.2) as if the new assumptions preserved a large part of the problem-solving ability of their predecessors. ⟨Kuhn 1970: 169⟩
(17.3) as if the new assumptions were more precise than their predecessors. ⟨Kuhn 1970: 153–54⟩
(17.4) as if the new assumptions could successfully predict unknown phenomena. ⟨Kuhn 1970: 97, 154⟩
(17.5) as if they were merely accretional change. ⟨Kuhn 1970: 139⟩
(17.6) as if they were holistic conversions when in fact they were arrived at piecemeal. ⟨Laudan 1984: 78⟩
(17.7) as if they did not require massive reinterpretation of evidence. ⟨Feyerabend 1975: 89⟩
(17.8) without giving all the evidence for the new guiding assumptions, particularly in textbooks and popularizations. ⟨Kuhn 1970: 136–37; 1977: 327⟩
(17.9) as if progress had occurred in the transition from the old set of guiding assumptions to the new set. ⟨Kuhn 1970: 166⟩

7.2. *Theories*

(18) Theories developed from a set of guiding assumptions:
(18.1) may be inconsistent with each other. ⟨Lakatos 1978: 57; Feyerabend; Laudan 1977: 81, 85⟩
(18.2) are the basis on which an associated set of structuring presuppositions is appraised. ⟨Laudan 1977: 82⟩
(18.3) may be unaffected by changes in the guiding assumptions. ⟨Kuhn 1977: 267; Laudan 1977: 96⟩
(19) Theories are:
developed methodically from a set of guiding assumptions utilizing heuristic principles contained in those assumptions. ⟨Lakatos 1978: 47, 50; Laudan 1977: 92⟩
(20) Scientists prefer a theory which:

(20.1) can solve some of the empirical difficulties confronting its rivals. ⟨Laudan 1977: 18, 27; Kuhn 1979: 148⟩
(20.2) can turn apparent counter-examples into solved problems. ⟨Laudan, 1977: 31⟩
(20.3) can solve problems it was not invented to solve. ⟨Laudan 1984: 100; Lakatos 1978: 32⟩
(20.4) can solve problems not solved by its predecessors. ⟨Kuhn 1970: 97, 153; Lakatos 1978: 66–70; Laudan 1984: 100⟩
(20.5) can solve all the problems solved by its predecessors plus some new problems. ⟨Lakatos 1978: 32⟩
(20.6) can solve the largest number of important empirical problems while generating the fewest important anomalies and conceptual difficulties. ⟨Laudan 1977: 5, 13, 66, 68, 119⟩
(21) The appraisal of a theory:
(21.1) is based in part on its internal consistency and its consistency with other prevalent beliefs. ⟨Laudan 1977: 14, 49⟩
(21.2) is based on its general track record in solving problems, rather than its specific success at dealing with problems currently under investigation. ⟨Laudan 1977: 97⟩
(21.3) is based on the success of the guiding assumptions with which the theory is associated. ⟨Lakatos 1978: 33–35, 47; Laudan 1977: 107; Feyerabend 1975: 181–82⟩
(21.4) is based entirely on those phenomena gathered for the express purpose of testing the theory and which would be unrecognized but for that theory. ⟨Lakatos 1978: 38⟩
(21.5) is not based on whether it solves socially important or pressing problems. ⟨Laudan 1984: 98; Kuhn 1970: 69⟩
(21.6) is based on phenomena which can be detected and measured without using assumptions drawn from the theory under evaluation. ⟨Laudan 1977: 143⟩
(21.7) is usually based on only a very few experiments, even when those experiments become the grounds for abandoning the theory. ⟨Lakatos 1978: 65⟩
(21.8) is sometimes favorable even when scientists do not

fully believe the theory, specifically when the theory shows a high rate of solving problems. ⟨Laudan 1977: 22–23, 110, 119, 125⟩
(21.9) is relative to prevailing doctrines of theory assessment and to rival theories in the field. ⟨Laudan 1977: 1–3, 124; 1984: 27–8; Kuhn 1983a: 684⟩
(21.10) occurs in circumstances in which scientists can usually give reasons for identifying certain problems as crucial for testing a theory. ⟨Laudan 1984: 10⟩
(21.11) depends on certain tests regarded as "crucial" because their outcome permits a clear choice between contending theories. ⟨Laudan 1984: 100⟩
(22) Besides using empirical criteria to assess theories, scientists also judge theories in terms of their:
(22.1) conceptual coherence and clarity. ⟨Laudan 1977: 45, 49⟩
(22.2) consistency. ⟨Laudan 1977: 49⟩
(22.3) compatibility with metaphysical beliefs. ⟨Feyerabend 1981a: 60; Laudan 1977: 49, 55; Kuhn 1977: 325⟩
(22.4) compatibility with theories in other fields. ⟨Laudan 1977: 49, 55⟩
(23) Empirical difficulties confronting a theory:
(23.1) are never sufficient to cause the rejection of that theory. ⟨Feyerabend 1981b: 142; Lakatos 1978: 71–2; Laudan 1977: 27; Kuhn 1970: 77–80⟩
(23.2) are always present. ⟨Feyerabend 1975: 55, 58, 65–6; 1981a: 106; Lakatos 1978: 48, 50; Kuhn 1970: 52, 80⟩
(23.3) are often suspect, because dependent on assumptions derived from rival theories. ⟨Feyerabend 1975: 67; Lakatos 1978: 14–16, 43, 45, 62, 73–4, 111, 40–1⟩
(23.4) are rarely regarded as unsolvable by proponents of that theory. ⟨Lakatos 1978: 35; Kuhn 1970: 35–7, 52⟩
(23.5) can often be found only by developing a rival theory. ⟨Feyerabend 1975: 29, 39, 41; 1981b: 142⟩
(23.6) raise doubts about all the collateral assumptions involved in deriving the failed prediction, as well as for the theory. ⟨Lakatos 1978: 16, 40–1, 111; Laudan 1977: 27, 41⟩

(23.7) are often 'neutralized' by developing face-saving auxiliary hypotheses. ⟨Lakatos 1978: 14–17, 43, 45, 62, 73–4⟩
(24) Almost all theories derive their empirical support from a few successful tests and have to be tinkered with, or distorted, in order to cope with the rest of the evidence. ⟨Feyerabend 1975: 55, 65, 98; 1970: 296⟩
(25) Theories never predict phenomena without the use of additional hypotheses, separate from the theory. ⟨Lakatos 1978: 16, 40–1, 111; Laudan 1977: 72; Kuhn 1970: 46; Feyerabend 1965: 167⟩
(26) A successful prediction confirms all the assumptions used in its derivation. ⟨Lakatos 1978: 16–17; Laudan 1977: 43⟩
(27) Earlier solutions to problems are often recognized as merely approximate only in the light of later solutions. ⟨Laudan 1977: 22–4; Lakatos 1978: 50–1; Kuhn 1970: 30–1; Feyerabend⟩

7.3. *Data*

(28) Empirical data:
(28.1) would not be investigated but for the attention directed to them by guiding assumptions. ⟨Kuhn 1970: 24, 76, 84, 163–64, 192–94; 1977: 308–9; 1963: 357⟩
(28.2) are thought to be different after a change in guiding assumptions. ⟨Kuhn 1970: 111–12, 118–19⟩
(28.3) differ when different guiding assumptions are applied to the same natural phenomena. ⟨Kuhn 1970: 123–24, 126⟩
(28.4) once regarded as veridical, may be disregarded after a change in guiding assumptions. ⟨Kuhn 1970: 129⟩
(28.5) partially define the concepts used to describe them. ⟨Kuhn 1970: 197; 1977: 303, 308⟩
(28.6) are theory-laden. ⟨Popper 1959: 94–5; Kuhn 1970: 123–24, 126; Lakatos 1978: 14; Laudan 1977: 15⟩
(28.7) always presuppose a theory concerning the behavior of the instruments used to collect them. ⟨Lakatos 1978: 14–16, 43, 45, 62, 73–4⟩
(28.8) are collected even before a theory of the instruments used to collect them exists. ⟨Feyerabend 1975: 103; Lakatos 1978: 14–16⟩

(28.9) are valued for their precision only if their theoretical implications are uncertain. ⟨Lakatos 1978: 73, 78⟩
(28.10) are valued according to the value of the theory they test. ⟨Lakatos 1978: 73, 78⟩
(28.11) vary in importance in different historical contexts. ⟨Laudan 1977: 33⟩
(28.12) will be accepted as authentic only after prolonged scrutiny, unless anticipated by theory. ⟨Kuhn 1970: 53–4, 57–8, 75; 1977: 166, 171, 174, 175⟩

7.4. *Methods and Aims*

(29) Methodological rules:
(29.1) are explicitly formulated only when guiding assumptions are disputed. ⟨Kuhn 1970: 47–8⟩
(29.2) are explicitly formulated as a matter of routine. ⟨Popper 1959: 53; Lakatos 1978: 48–9; Laudan 1977: 80–1⟩
(29.3) are independent of nonscientific concerns. ⟨Kuhn 1970: 164⟩
(29.4) are dependent on nonscientific concerns. ⟨Toulmin 1967: 465⟩
(29.5) define solvable problems. ⟨Kuhn 1970: 37, 164; Laudan 1977: 25⟩
(29.6) do not uniquely determine the ontology of scientific theories. ⟨Laudan 1984: 75⟩
(29.7) do not change when guiding assumptions change. ⟨Kuhn 1977: 335; Lakatos 1978: 47⟩
(29.8) always change when guiding assumptions change. ⟨Kuhn 1970: 92, 103, 106, 108, 109⟩
(29.9) sometimes change when guiding assumptions change. ⟨Laudan 1984: 33–40⟩
(29.10) are always imprecise. ⟨Kuhn 1977: 321–22; Laudan 1984: 52⟩
(29.11) when taken as an ensemble invariably conflict with one another. ⟨Kuhn 1977: 321–22⟩
(29.12) do not provide decisions mechanically. ⟨Kuhn 1977: 331⟩
(29.13) are repeatedly violated, in important cases. ⟨Feyerabend 1975: 23, 112⟩

(29.14) are believed by scientists to create consensus. ⟨Laudan 1984: 6⟩
(29.15) are sometimes themselves the subject of dispute. ⟨Laudan 1984: 12, 33, 37, 46, 52, 97⟩
(29.16) often provide compelling arguments for choosing between rival sets of guiding assumptions. ⟨Laudan 1984: 25, 28–30, 92⟩
(29.17) do not provide logically or probabilistically compelling arguments for choosing between guiding assumptions. ⟨Kuhn 1970: 94⟩
(29.18) are shared by competing sets of guiding assumptions. ⟨Lakatos 1978: 47⟩
(29.19) are revised if they conflict with an important theory. ⟨Laudan 1977: 58, 59; 1984: 38–40⟩
(29.20) are not uniquely specified by specifying aims. ⟨Laudan 1984: 37–8, 41⟩
(29.21) are sometimes abandoned when they conflict with accepted theory, rather than vice versa. ⟨Laudan 1977: 58–9⟩
(29.22) change over time. ⟨Laudan 1984: 33–40; Toulmin 1967: 465; Kuhn 1970: 90, 94⟩
(29.23) do not change over time. ⟨Lakatos 1978: 133–34⟩
(30) The aims of science:
(30.1) are believed to be non-arbitrary by scientists. ⟨Laudan 1984: 48⟩
(30.2) change over time. ⟨Laudan 1984: 47⟩
(30.3) are the subject of disputes which are not resolvable by reasoned argument. ⟨Popper 1959: 53; Lakatos 1978: 42; Kuhn 1970: 148⟩
(30.4) may be disputed even if agreement exists over methodological rules. ⟨Laudan 1984: 45⟩
(30.5) may be criticized as unachievable. ⟨Laudan 1984: 51, 60⟩
(30.6) may be criticized because they cannot be *shown* to be achievable. ⟨Laudan 1984: 52, 61⟩
(30.7) may be criticized for conflicting with important theories. ⟨Laudan 1984: 53–60⟩
(30.8) may be diverse, even in a single field. ⟨Kuhn 1970: 205⟩

7.5. *Periodization and Cumulativity*

(31) In the early stages of a science:
(31.1) facts are gathered haphazardly and are all considered equally important. ⟨Kuhn 1970: 157⟩
(31.2) there are competing schools that work from different sets of guiding assumptions and seek to undermine rivals. ⟨Kuhn 1970: 12, 13, 15; 1977: 231, 274–75⟩
(31.3) each school considers fundamental only those phenomena that can be accounted for by its guiding assumptions. ⟨Kuhn 1970: 12–13; 1963: 354⟩
(31.4) each school exhibits the same kind of progress that occurs in fully developed fields of science during periods of disagreement over guiding assumptions. ⟨Kuhn 1970: 162–63⟩
(31.5) results are reported in books that develop the subject from fundamentals and are addressed to both specialists and a larger public. ⟨Kuhn 1970: 13, 19–20⟩
(32) The transition to a developed science occurs only once in a field. ⟨Kuhn 1970: 17, 79⟩
(33) In a fully-developed science:
(33.1) there are fewer and less divisive differences between scientists. ⟨Fleck 1979: 83⟩
(33.2) guiding assumptions are less obvious. ⟨Holton 1973: 64⟩
(33.3) most researchers most of the time treat the dominant set of guiding assumptions as immune from criticism. ⟨Kuhn 1970: 17; 1977: 295, 273, 275⟩
(33.4) the dominant set of guiding assumptions is not immune from criticism and alternatives are actively considered. ⟨Laudan 1977: 138, 134⟩
(33.5) practical problems and other extrascientific considerations do not determine the design of research or the interpretation of findings. ⟨Kuhn 1970: 36, 96; Laudan 1977: 224; Lakatos 1978: 102; Feyerabend⟩
(33.6) research results are reported to scientific societies, published in specialized journals, and codified in textbooks. ⟨Kuhn 1970: 19, 137⟩
(34) For scientific revolutions (changes in guiding assumptions) see no. 16 above.

(35) Scientific knowledge is cumulative in that:
(35.1) scientists can select problems known to be solvable by existing techniques during periods of consensus about guiding assumptions. ⟨Kuhn 1970: 36, 37, 52, 96, 179; 1977: 234, 235⟩
(35.2) some of the problems solved in an earlier period are retained in later periods. ⟨Kuhn 1970: 25; 1963: 358⟩
(35.3) all the problems solved in an earlier period are retained in later periods. ⟨Lakatos 1978: 39, 69⟩
(35.4) abandoned guiding assumptions are often revived. ⟨Holton 1973: 59⟩
(36) Scientific knowledge is *not* cumulative in that:
(36.1) once-accepted exemplars are later abandoned. ⟨Kuhn 1970: 180–81; 1977: 285⟩
(36.2) once abandoned, guiding assumptions are never revived. ⟨Kuhn 1970: 206⟩
(36.3) some of the empirical assertions associated with a set of guiding assumptions are always lost when the set is replaced. ⟨Feyerabend 1975: 176; Laudan 1977: 140, 148–49; 1984: 126, 127; Kuhn 1970: 108–9, 148⟩
(36.4) successor theories are not required to explain the success of their predecessors. ⟨Laudan 1984: 132–33⟩

7.6. *Miscellaneous*

(37) Scientific fields:
(37.1) are defined by communities of researchers, not by guiding assumptions. ⟨Kuhn 1977: 177, 210, 290–91, 295; Fleck 1979: 39⟩
(37.2) are made up of scientists who generally agree about the assertions of their discipline, the central problems to be solved, the appropriate quantitative and experimental techniques, and the explanatory and theoretical entities to be tested. ⟨Laudan 1984: 3⟩
(37.3) may, as in the case of biochemistry, be hybrids of old fields. ⟨Toulmin 1967: 468⟩
(38) Communities of researchers:
(38.1) are identified by the set of exemplars they accept. ⟨Kuhn 1970: 187; 1977: 307⟩

(38.2) define scientific fields. ⟨Kuhn 1970: 177, 210; 1977: 290, 295; Fleck 1979: 39⟩

(38.3) are the embodiment of scientific authority, which is vested in the community, not in external political authority. ⟨Kuhn 1970: 167–8⟩.

(38.4) grow larger in numbers of distinct communities with time. ⟨Kuhn 1977: 289⟩

(38.5) do not fully agree with other communities about what counts as data, since different aspects of experience are given significance by different exemplars. ⟨Kuhn 1977: 308–9⟩

(38.6) train new members by having them work through canonical sets of problem solutions. ⟨Kuhn 1970: 43, 46–7, 189; 1977: 229, 307; 1963: 331⟩

(39) Science:

(39.1) is unique, no other activity being characterized by long periods in which research is carried out under a single set of guiding assumptions. ⟨Kuhn 1977: 209, 272⟩

(39.2) is unique in subjecting all its claims to empirical scrutiny. ⟨Popper 1963: 114⟩

(39.3) is not unique as an intellectual enterprise. ⟨Laudan 1977: 189–92⟩

(39.4) must have both exemplars and theoretical generalizations. ⟨Kuhn 1977: 288⟩

(39.5) is characterized by series of theories. Isolated theories are not scientific. ⟨Lakatos 1978: 33–5, 47⟩

(39.6) is characterized by theories that predict phenomena not predicted by predecessor theories, or that face difficulties solved by successors. Other theories are not scientific. ⟨Lakatos 1978: 33–5⟩

(39.7) is characterized by theories that face empirical difficulties. Other theories are not scientific. ⟨Lakatos, 1978: 33–5⟩

(39.8) exhibits the properties of its groups of practitioners. ⟨Kuhn 1970: 210⟩

(39.9) is not defined by the presence of guiding assumptions, since many nonsciences have those. ⟨Kuhn 1970: 179; 1977: 259⟩