

---

## References

- Adams, E. W. (1966). On the nature and purpose of measurement. *Synthese*, 16, 125-169.
- Adams, E. W. (1979). Measurement theory. In P. D. Asquith & H. E. Kyburg (Eds.), *Current issues in the philosophy of science* (pp. 207-227). East Lansing, MI: Philosophy of Science Association.
- Adams, E. W., Fagot, R. F., & Robinson, R. E. (1965). A theory of appropriate statistics. *Psychometrika*, 30, 99-127.
- Adler, H. E. (1980). Vicissitudes of Fechnerian psychophysics in America. In R. W. Rieber & K. Salzinger (Eds.), *Psychology: Theoretical-historical perspectives* (pp. 11-23). New York: Academic Press.
- Aristotle. (1941a). *Categoriae* (E. M. Edghill, Trans.). In R. McKeon (Ed.), *The basic works of Aristotle* (pp. 7-37). New York: Random House.
- Aristotle. (1941b). *Metaphysics*. (W. D. Ross, Trans.) In R. McKeon (Ed.), *The basic works of Aristotle* (pp. 689-926). New York: Random House.
- Baird, J. C. & Noma, E. (1978). *Fundamentals of scaling and psychophysics*. New York: Wiley.
- Baldwin, J. M. (1902). *Dictionary of philosophy and psychology* (vol. 2). London: Macmillan.
- Bergmann, G. & Spence, K. W. (1941). Operationism and theory in psychology. *Psychological Review*, 48, 1-14.
- Bergmann, G., & Spence, K. W. (1944). The logic of psychophysical measurement. *Psychological Review*, 51, 1-24.
- Bartlett, R. J. (1940). Measurement in psychology. *Advancement of Science*, 1, 422-441.
- Beals, R., Krantz, D. H., & Tversky, A. (1968). Foundations of multidimensional scaling. *Psychological Review*, 75, 127-142.
- Birkhoff, G., & MacLane, S. (1965). *A survey of modern algebra*. New York: Macmillan.
- Boring, E. G. (1929). *A history of experimental psychology*. New York: Century.
- Boring, E. G. (1945). The use of operational definitions in science. *Psychological Review*, 52, 243-245.
- Bostock, D. (1979). *Logic and arithmetic: Vol. 2. Rational and irrational numbers*. Oxford, England: Clarendon.
- Brentano, F. (1874). *Psychology from an empirical standpoint*. (English translation, 1973). New York: Humanities.
- Bridgman, P. W. (1927). *The logic of modern physics*. New York: Macmillan.

- Bridgman, P. W. (1938). Operational analysis. *Philosophy of Science*, 5, 114–131.
- Bridgman, P. W. (1950). *Reflections of a physicist*. New York: Philosophical Library.
- Burington, R. S. (1965). *Handbook of mathematical tables and formulas*. New York: McGraw-Hill.
- Burke, C. J. (1953). Additive scales and statistics. *Psychological Review*, 60, 73–75.
- Byerley, H. C. (1974). Realist foundations of measurement. In K. F. Schaffner & R. S. Cohen (Eds.), *P.S.A.* 1972, (pp. 375–384). Dordrecht-Holland: Reidel.
- Campbell, N. R. (1920). *Physics, the elements*. Cambridge: Cambridge University Press.
- Carnap, R. (1966). *Philosophical foundations of physics*. New York: Basic Books.
- Carroll, J. D., & Chang, J. J. (1970). Analysis of individual differences in multidimensional scaling via an N-way generalization of 'Eckart-Young' decomposition. *Psychometrika*, 35, 283–319.
- Carroll, J. D., & Wish, M. (1974). Multidimensional perceptual models and measurement methods. In E. C. Carterette & M. P. Friedman (Eds.) *Handbook of perception* (Vol. 2, pp. 391–447). New York: Academic Press.
- Cattell, J. McK. (1950). Mental tests and measurements. *Mind*, 15, 373–380.
- Cattell, R. B. (1971). *Abilities: Their growth and action*. Boston: Houghton, Mifflin.
- Cliff, N. (1982). What is and isn't measurement. In G. Keren (Ed.), *Statistical and methodological issues in psychology and social sciences research* (pp. 3–38). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Cohen, M. R., & Nagel, E. (1934). *An Introduction to logic and scientific method*. London: Routledge & Kegan Paul.
- Comrey, A. L. (1950). An operational approach to some problems in psychological measurement. *Psychological Review*, 57, 217–228.
- Coombs, C. H. (1950). Psychological scaling without a unit of measurement. *Psychological Review*, 57, 145–158.
- Coombs, C. H. (1964). *A theory of data*. New York: Wiley.
- Coombs, C. H., Dawes, R. M., & Tversky, A. (1970). *Mathematical psychology: an elementary introduction*. Englewood Cliff, NJ: Prentice Hall.
- Coombs, C. H., & Huang, L. C. (1970). Polynomial psychophysics of risk. *Journal of Mathematical Psychology*, 7, 317–338.
- Coombs, C. H., Raiffa, H., & Thrall, R. M. (1954). Some views on mathematical models and measurement theory. *Psychological Review*, 61, 132–144.
- Dawes, R. M. (1972). *Fundamentals of attitude measurement*. New York: Wiley.
- Dedekind, R. (1909). *Essays on the theory of numbers*. Chicago: Open Court.
- Dingle, H. (1950). A theory of measurement. *British Journal of the Philosophy of Science*, 1, 5–26.
- Drake, S. (1957). *Discoveries and opinions of Galileo*. New York: Doubleday.
- Ebbinghaus, H. (1908). *Psychology: an elementary textbook*. (M. Meyer, Trans.). Boston: Heath.
- Ellis, B. (1966). *Basic concepts of measurement*. Cambridge: Cambridge University Press.
- Euclid. (1908). *Elements, Book V*. In *The Thirteen books of Euclid's elements*, Vol. 2. (T. L. Heath, Trans.) Cambridge: Cambridge University Press.
- Eysenck, H. J. (1973). *The Measurement of intelligence*. Lancaster: Medical and Technical.
- Falmagne, J. C. (1986). Psychophysical measurement and theory. In K. R. Boff, L. Kaufman, & J. P. Thomas (Eds.), *Handbook of perception and human performance* (Vol. 1, pp. 1–65). New York: Wiley.
- Fechner, G. T. (1860). *Elemente der psychophysik*. Leipzig, Breitkopf & Hartel.
- Field, H. (1980). *Science without numbers*. Oxford, England: Basil Blackwell.
- Fishbein, M. (1967). A Behavior theory approach to the relations between beliefs about an object and the attitude toward the object. In M. Fishbein (Ed.), *Readings in attitude theory and measurement* (pp. 389–400). New York: Wiley.
- Fishburn, P. C. (1970). *Utility theory for decision making*. New York: Wiley.
- Forrest, P., & Armstrong, D. M. (1987). The nature of number. *Philosophical Papers*, 16, 165–186.
- Fraser, C. O. (1980). Measurement in psychology. *British Journal of Psychology*, 71, 23–34.
- Frege, G. (1884). *Die Grundlagen der Arithmetik*. (Reprinted with J. L. Austin, Trans.) as *The Foundations of arithmetic*. Oxford: Blackwell and Mott, 1950.
- Freud, S. (1895). A project for a scientific psychology. *Standard edition of the complete psychological works of Sigmund Freud*, Vol. 1, pp. 283–398. London: Hogarth.
- Galton, F. (1879). Psychometric experiments. *Brain*, 2, 147–162.
- Green, B. F. (1954). Attitude measurement. In *Handbook of social psychology*, Vol. 1. (pp. 335–369). Reading, MA: Addison-Wesley.
- Guilford, J. P. (1954). *Psychometric methods*. New York: McGraw Hill.
- Guttman, L. (1944). A basis for scaling qualitative data. *American Sociological Review*, 9, 139–150.
- Guttman, L. (1968). A general non-metric technique for finding the smallest coordinate space for a configuration of points. *Psychometrika*, 33, 469–506.
- Hacking, I. (1983). *Representing and intervening*. Cambridge: Cambridge University Press.
- Helmholtz, H. V. (1887). Numbering and measuring from an epistemological viewpoint. (Reprinted in *Hermann von Helmholtz: Epistemological writings*, P. Hertz & M. Schlick (Eds.), *Boston studies in the philosophy of science*, Vol. 37, pp. 72–114.) Dordrecht-Holland, Reidel, 1977.
- Herbart, J. F. (1816). *A textbook of psychology*. (M. K. Smith, Trans.). New York: Appleton.
- Holder, O. (1901). Die axiome der qualitat und die lehre vom mass. *Berichte der Sachsischen Gesellschaft der Wissenschaften, Mathematische-Physische Klasse*, 53, 1–64.
- Hume, D. (1888). *A treatise of human nature*. (L. A. Selby-Bigge, Ed.). London: Oxford University Press.
- Hunt, E. (1980). Intelligence as an information-processing concept. *British Journal of Psychology*, 71, 449–474.
- Jevons, W. S. (1873). *The principles of science*. (Reprinted New York: Dover, 1958).
- Johnson, H. M. (1936). Pseudo-mathematics in the mental and social sciences. *American Journal of Psychology*, 48, 342–351.
- Kant, I. (1786). *Metaphysical foundations of natural science*. (J. Ellington Trans. 1970). Indianapolis: Bobbs-Merrill.
- Katz, D., & Stotland, E. (1959). A preliminary statement to a theory of attitude structure and change. In S. Koch (Ed.), *Psychology: a study of a science* (Vol. 3, pp. 423–475). New York: McGraw Hill.
- Kitcher, P. (1983). *The nature of mathematical knowledge*. Oxford: Oxford University Press.
- Krantz, D. H. (1968). A survey of measurement theory. In G. B. Dantzig & A. F. Veinott (Eds.), *Mathematics of the decision sciences, part 2* (pp. 314–350). American Mathematical Society. RI: Providence.
- Krantz, D. H. (1972). A theory of magnitude estimation and cross modality matching. *Journal of Mathematical Psychology*, 9, 168–199.
- Krantz, D. H., Luce, R. D., Suppes, P., & Tversky, A. (1971). *Foundations of measurement*, Vol. 1. New York: Academic Press.
- Krantz, D. H., & Tversky, A. (1971). Conjoint measurement analysis of composition rules in psychology. *Psychological Review*, 78, 151–169.
- Krantz, D. H., & Tversky, A. (1975). Similarity of rectangles: an analysis of subjective dimensions. *Journal of Mathematical Psychology*, 12, 4–34.
- Kruskal, J. B. (1964a) Multidimensional scaling by optimizing goodness of fit to a nonmetric hypothesis. *Psychometrika*, 29, 1–27.
- Kruskal, J. B. (1964b) Nonmetric multidimensional scaling: a numerical method. *Psychometrika*, 29, 115–129.
- Kuhn, T. S. (1961). The function of measurement in modern physical science. In H. Woolf (Ed.), *Quantification* (pp. 31–63). New York: Bobbs-Merrill.
- Kulpe, O. (1895). *Outline of psychology*. London: Sonnenschein.
- Lear, J. (1982). Aristotle's philosophy of mathematics. *Philosophical Review*, 91, 161–192.
- Levitt, W. J., Riemersma, J. B., & Bunt, A. A. (1972). Binaural additivity of loudness. *British Journal of Mathematical and Statistical Psychology*, 25, 51–68.

- Lindquist, F. (1951). *Educational measurement*. Washington, DC: American Council of Education.
- Lord, F. M. (1953). On the statistical treatment of football numbers. *American Psychologist*, 8, 750-751.
- Lorge, I. (1951). The fundamental nature of measurement. In F. Lindquist (Ed.), *Educational measurement* (pp. 533-559). Washington, DC: American Council of Education.
- Luce, R. D. (1959). *Individual choice behavior*. New York: Wiley.
- Luce, R. D. (1977). Thurstone's discriminial processes fifty years later. *Psychometrika*, 42, 461-489.
- Luce, R. D. (1979). Suppes' contribution to the theory of measurement. In R. J. Bogdan (Ed.), *Patrick Suppes*, Dordrecht-Holland: Reidel, (pp. 93-110).
- Luce, R. D. (1986). Uniqueness and homogeneity of ordered relational structures. *Journal of Mathematical Psychology*, 30, 391-415.
- Luce, R. D. (1987). Measurement structures with Archimedean ordered translation groups. *Order*, 4, 165-189.
- Luce, R. D., & Tukey, J. W. (1964). Simultaneous conjoint measurement: a new type of fundamental measurement. *Journal of Mathematical Psychology*, 1, 1-27.
- Marz, J. R. (1973). The concept of attitude. *Inquiry*, 16, 168-205.
- McCall, W. (1923). *How to measure in education*. New York: Macmillan.
- McClelland, G., & Coombs, C. H. (1975). Ordmet: a general algorithm for constructing all numerical solutions to ordered metric data. *Psychometrika*, 40, 269-290.
- McEvoy, J. (1982). *The philosophy of Robert Grossseteste*. Oxford: Clarendon Press.
- McGregor, D. (1935). Scientific measurement and psychology. *Psychological Review*, 42, 246-266.
- Merton, R. K., Sills, D. L., & Stigler, S. M. (1984). The Kelvin dictum and social science: an excursion into the history of an idea. *Journal of the History of Behavioral Sciences*, 20, 319-331.
- Michell, J. (1986). Measurement scales and statistics: a clash of paradigms. *Psychological Bulletin*, 100, 398-407.
- Michell, J. (1988). Some problems in testing the double cancellation condition in conjoint measurement. *Journal of Mathematical Psychology*, 32, 466-473.
- Mill, J. S. (1843). *A system of logic*. (Reprinted in *Collected works of John Stuart Mill*, Vol. 7, J. M. Robson, Ed.). Toronto: University of Toronto Press, 1973.
- Narens, L. (1981). On the scales of measurement. *Journal of Mathematical Psychology*, 24, 249-275.
- Narens, L. (1985). *Abstract measurement theory*. Cambridge, MA: MIT Press.
- Narens, L., & Luce, R. D. (1986). Measurement: the theory of numerical assignments. *Psychological Bulletin*, 99, 166-180.
- Newman, E. B. (1974). On the origin of 'scales of measurement'. In H. R. Moskowitz et al. (Eds.), *Sensation and measurement* (pp. 137-145). Dordrecht-Holland: Reidel.
- Newton, I. (1728). Universal arithmetic: or, a treatise of arithmetical composition and resolution. In D. T. Whiteside (Ed.), *The mathematical works of Isaac Newton*, (Vol. 2, pp. 3-134). (1967). New York: Johnson Reprint Corp.
- Nietzsche, F. (1968). *The will to power*. (W. Kaufmann & R. J. Hollingdale, Trans.) New York: Random House.
- Nunnally, J. C. (1967). *Psychometric theory*. New York: McGraw-Hill.
- O'Neil, W. M. (1969). *Fact and theory*. Sydney: Sydney University Press.
- Oresme, N. (1968). *Tractatus de Configurationibus qualitatum et Motuum*. In M. Clagett (Ed. & Trans.) *Nicole Oresme and the medieval geometry of qualities and motions*. Wisconsin: University Press.
- Pap, A. (1962). *An Introduction to the philosophy of science*. London: Eyre and Spottiswoode.
- Pearson, K. (1978). *The history of statistics in the seventeenth and eighteenth centuries*. London: Griffin.
- Pertine, R., Wright, B. D., & Wainer, H. (1979). The Rasch model as additive conjoint measurement. *Applied Psychological Measurement*, 3, 237-255.
- Pollatsek, A., & Tversky, A. (1970). A theory of risk. *Journal of Mathematical Psychology*, 7, 540-553.
- Reese, T. W. (1943). The application of the theory of physical measurement to the measurement of psychological magnitudes, with three experimental examples. *Psychological Monographs*, 55, 1-89.
- Rokeach, M. (1968). The nature of attitudes. In D. L. Sills (Ed.), *International encyclopedia of the social sciences*, Vol. 1, (pp. 449-458), New York: Collier & Macmillan.
- Roberts, F. S. (1976). *Discrete mathematical models*: Englewood Cliffs, NJ: Prentice-Hall.
- Roberts, F. S. (1979). *Measurement theory*. Reading, MA: Addison-Wesley.
- Rozeboom, W. W. (1966). Scaling theory and the nature of measurement. *Synthese*, 16, 170-233.
- Russell, B. (1903). *Principles of mathematics*. Cambridge: Cambridge University Press.
- Russell, L. J. (1928). Review of Bridgman's 'The Logic of Modern Physics'. *Mind*, 37, 355-361.
- Scott, D. (1964). Measurement models and linear inequalities. *Journal of Mathematical Psychology*, 1, 233-247.
- Shaw, M. E., & Wright, J. M. (1967). *Scales for the measurement of attitudes*. New York: McGraw-Hill.
- Shepard, R. N. (1962a). Analysis of proximities: multidimensional scaling with an unknown distance function. I. *Psychometrika*, 27, 125-140.
- Shepard, R. N. (1962b). Analysis of proximities: multidimensional scaling with an unknown distance function. II. *Psychometrika*, 27, 219-246.
- Smith, B. O. (1938). *Logical aspects of educational measurement*. New York: Columbia University Press.
- Spearman, C. (1904). General intelligence, objectively determined and measured. *American Journal of Psychology*, 15, 201-293.
- Spearman, C. (1937). *Psychology down the ages*, Vol. 1. London: Macmillan.
- Stevens, S. S. (1935a). The operational definition of psychological terms. *Psychological Review*, 42, 517-527.
- Stevens, S. S. (1935b). The operational basis of psychology. *American Journal of Psychology*, 47, 323-330.
- Stevens, S. S. (1939). Psychology and the science of science. *Psychological Bulletin*, 36, 221-263.
- Stevens, S. S. (1946). On the theory of scales of measurement. *Science*, 103, 667-680.
- Stevens, S. S. (1951). Mathematics, measurement and psychophysics. In S. S. Stevens (Ed.), *Handbook of experimental psychology* (pp. 1-49). New York: Wiley.
- Stevens, S. S. (1959). Measurement, psychophysics and utility. In C. W. Churchman, & P. Ratoosh (Eds.), *Measurement: definition and theories* (pp. 18-63). New York: Wiley.
- Stevens, S. S. (1974). S. S. Stevens. In G. Lindzey (Ed.) *A History of psychology in autobiography*, (Vol. VI, pp. 393-420). Englewood Cliffs, NJ: Prentice Hall.
- Stevens, S. S. (1986). *Psychophysics: Introduction to its perceptual, neural, and social prospects*. Second Edition. New Brunswick, NJ: Transaction Books.
- Suppes, P. (1957). *Introduction to logic*. Princeton, NJ: Von Nostrand.
- Suppes, P. (1959). Measurement, empirical meaningfulness and three-valued logic. In C. W. Churchman & P. Ratoosh (Eds.), *Measurement: definition and theories* (pp. 129-143). New York: Wiley.
- Suppes, P. (1979). "Replies." In R. J. Bogdan (Ed.), *Patrick Suppes* (pp. 207-232). Dordrecht-Holland: Reidel.
- Suppes, P., & Zinnes, J. (1963). Basic measurement theory. In R. D. Luce, R. R. Bush, & E. H. Galanter (Eds.), *Handbook of mathematical psychology* (Vol. 1, pp. 1-76). New York: Wiley.
- Thomas, L. G. (1942). Mental tests as instruments of science. *Psychological Monographs*, 54.
- Thomson, W. (1891). *Popular lectures and addresses* (Vol. 1). London: Macmillan.
- Thurstone, L. L. (1927a). A law of comparative judgment. *Psychological Review*, 34, 278-286.
- Thurstone, L. L. (1927b). Psychophysical analysis. *American Journal of Psychology*, 38, 368-389.
- Thurstone, L. L. (1927c). Three psychophysical laws. *Psychological Review*, 34, 424-432.

- Thurstone, L. L. (1927d). The method of paired comparisons for social values. *Journal of Abnormal and social psychology*, 21, 384-400.
- Thurstone, L. L. (1931). The measurement of social attitudes. *Journal of Abnormal and Social Psychology*, 26, 249-269.
- Thurstone, L. L. (1935). *Vectors of Mind*. Chicago: University of Chicago Press.
- Thurstone, L. L. (1947). *Multiple factor analysis*. Chicago: University of Chicago Press.
- Thurstone, L. L. & Chave, E. J. (1929). *The measurement of attitudes*. Chicago: University of Chicago Press.
- Titchener, E. B. (1905). *Experimental psychology* (Vols. 1-3). New York: Macmillan.
- Torgerson, W. S. (1958). *Theory and methods of scaling*. New York: Wiley.
- Tversky, A. (1967a). A general theory of polynomial conjoint measurement. *Journal of Mathematical Psychology*, 4, 1-20.
- Tversky, A. (1967b). Additivity, utility and subjective probability. *Journal of Mathematical Psychology*, 4, 175-201.
- Tversky, A. (1977). Features of similarity. *Psychological Review*, 84, 327-352.
- Tversky, A. & Gati, I. (1978). Studies of similarity. In E. Rosch & B. Lloyd (Eds.), *Cognition and Categorization* (pp. 79-98). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Tversky, A., & Gati, I. (1982). Similarity, separability and the triangle inequality. *Psychological Review*, 89, 123-154.
- Tversky, A., & Krantz, D. H. (1969). Similarity of schematic faces: a test of inter-dimensional additivity. *Perception and Psychophysics*, 5, 125-128.
- Tversky, A., & Krantz, D. H. (1970). The dimensional representation of the metric structure of similarity data. *Journal of Mathematical Psychology*, 7, 572-597.
- van der Ven, A.H.G.S. (1980). *Introduction to Scaling*. New York: Wiley.
- Wender, K. (1971). A test of independence of dimensions in multidimensional scaling. *Perception and Psychophysics*, 10, 30-32.
- Wiener-Ehrlich, W. K. (1978). Dimensional and metric structures in multidimensional stimuli. *Perception and Psychophysics*, 24, 399-414.
- Wish, M., Deutsch, M., & Biener, L. (1970). Differences in conceptual structures of nations: an exploratory study. *Journal of Personality and Social Psychology*, 16, 361-373.
- Wundt, W. M. (1873). *Principles of physiological psychology*. New York: Macmillan.
- Young, F. W. (1984). Scaling. *Annual Review of Psychology*, 35, 55-81.
- Yule, G. U., & Kendall, M. G. (1911). *An introduction to the theory of statistics*. London: Griffin.

## Author Index

### A

- Adams, E.W., 28, 29, 43, 44, 46, 58  
 Adler, H.E., 7, 18  
 Aristotle, 9  
 Armstrong, D.M., 58

- Carroll, J.D., 110, 111  
 Cattell, J. McK., 7  
 Cattell, R.B., 155  
 Chang, J.J., 110  
 Chave, E.J., 150  
 Cliff, N., 19  
 Cohen, M.R., 29  
 Comrey, A.L., 14  
 Coombs, C.H., 18, 118, 130, 131, 140, 145, 157

### B

- Baird, J.C., 110  
 Baldwin, J.M., 12  
 Bartlett, R.J., 15  
 Beals, R., 115, 116  
 Bergmann, G., 14, 25  
 Biener, L., 110  
 Birkhoff, G., 59  
 Boring, E.G., 7, 25  
 Bostock, D., 58, 59, 63  
 Brentano, F., 8  
 Bridgmann, P.W., 15, 26, 27, 28  
 Bunt, A.A., 104  
 Burington, R.S., 167  
 Burke, C.J., 43  
 Byerley, H.C., 28

### D

- Daves, R.M., 118, 130  
 Dedekind, R., 59  
 Deutsch, M., 110  
 Dingle, H., 16, 25  
 Drake, S., 6

### E

- Ebbinghaus, H., 7  
 Ellis, B., 9, 33, 34, 68  
 Euclid, 9, 54  
 Eysenck, H.J., 6, 8

### C

- Campbell, N.R., 9, 13, 14, 28, 45, 57, 68  
 Carnap, R., 29

## F

Fagot, R.F., 43, 44  
 Falmagne, J.C., 149  
 Fechner, G.T., 12  
 Field, H., 45  
 Fishbein, M., 150  
 Fishburn, P.C., 170  
 Forrest, P., 58  
 Fraser, C.O., 9  
 Frege, G., 13  
 Freud, S., 8

## G

Galton, F., 7  
 Gati, I., 116, 118, 119, 120, 127  
 Green, B.F., 19, 130  
 Guilford, J.P., 18  
 Guttman, L., 110, 171

## H

Hacking, I., 6  
 Helmholz, H.V., 9  
 Herbart, J.F., 7  
 Holder, O., 28  
 Huang, L.C., 157  
 Hume, D., 27  
 Hunt, E., 156

## J

Jevons, W.S., 6  
 Johnson, H.M., 8, 14

## K

Kant, I., 6  
 Katz, D., 150  
 Kendall, M.G., 6  
 Kitcher, P., 63  
 Krantz, D.H., 28, 29, 32, 33, 35, 54, 55, 57,  
 70, 73, 76, 77, 86, 104, 115, 116, 117,  
 127, 152, 157, 162  
 Kruskal, J.B., 110  
 Kuhn, T.S., 6  
 Kulpe, O., 7

## L

Lear, J., 13  
 Levelt, W.J., 104  
 Lindquist, F., 19  
 Lord, F.M., 43  
 Lorge, I., 19  
 Luce, R.D., 28, 29, 32, 33, 34, 35, 43, 54, 55,  
 57, 67, 68, 70, 73, 76, 77, 86, 91, 98,  
 152, 157, 161, 162

## M

MacLane, S., 59  
 Maze, J.R., 150  
 McCall, W., 8  
 McClelland, G., 145  
 McEvoy, J., 6  
 McGregor, D., 14  
 Merton, R.K., 6  
 Mitchell, J., 45, 104, 105  
 Mill, J.S., 13, 53

## N

Nagel, E., 29  
 Narens, L., 29, 157, 158, 160, 161  
 Newman, E.B., 14, 18  
 Newton, I., 58  
 Nietzsche, F., 6  
 Noma, E., 110  
 Nunnally, J.C., 174

## O

O'Neil, W.M., 27  
 Oresme, N., 11

## P

Pap, A., 29  
 Pearson, K., 6  
 Perline, R., 104  
 Pollatsek, A., 68

## R

Raiiffa, H., 18  
 Reese, T.W., 14  
 Riemersma, J.B., 104  
 Robinson, R.E., 43, 44  
 Rokeach, M., 150  
 Roberts, F.S., 43, 170  
 Rozeboom, W.W., 38, 44  
 Russell, B., 9, 28, 34  
 Russell, L.J., 25

## S

Scott, D., 79  
 Shaw, M.E., 91  
 Shepard, R.N., 110  
 Sills, D.L., 6  
 Smith, B.O., 14  
 Spearman, C., 7, 155  
 Spence, K.W., 14, 25  
 Stevens, S.S., 15, 16, 17, 18, 26, 31, 34, 43,  
 152, 158  
 Stigler, S.M., 6  
 Stotland, E., 150  
 Suppes, P., 28, 29, 31, 32, 33, 35, 43, 54, 55,  
 57, 70, 73, 76, 77, 86, 98, 152, 157,  
 158, 162, 167

## T

Thomas, L.G., 14  
 Thomson, W., 6  
 Thrall, R.M., 18

## V

van der Ven, A.H.G.S. 104, 110, 130

## W

Wainer, H., 104  
 Wender, K., 127  
 Wiener-Ehrlich, W.K., 127  
 Wish, M., 110, 111  
 Wright, B.D., 104  
 Wright, J.M., 91  
 Wundt, W.M., 7

## Y

Young, F.W., 18  
 Yule, G.U., 6

## Z

Zinnes, J.L., 29, 31, 33, 98, 158

# Subject Index

## A

- Abilities, *see* Mental ability
- Abstract entities, 29, 49, 63
- Additivity, 5, 8, 10, 11, 12, 13, 14, 15, 16, 33, 34, 39, 44, 51, 53, 68, 69, 77, 78, 86, 163
- Admissible transformations, 17, 36, 37, 43, 44, 45, 158
  - linear, 38
  - monotonic, 36, 37, 44
  - one to one, 37
  - similarities, 37, 39
- Aggregate magnitude, 55, 56, 58
- Antisymmetry, 52, 92, 166, 167, 168, 170, 172
- Archimedean condition, 32, 53, 54, 55, 69, 73–77, 78, 79, 84, 85, 161, 162, 163
- Aristotelean theory, 5, 8, 9, 10, 13
- Arithmetic, 43, 63
- Asymmetry, 92, 166, 167, 168, 169, 170, 172
- Attitudes, 19, 25, 91, 93, 94, 109, 129, 132, 149, 150–152
- Automorphism, 158, 159, 160

## C

- Campbellian theory, 13, 14, 15, 16, 20, 29, 34, 35, 45, 57
- Cancellation conditions,

- double, 69, 70–73, 74, 75, 77, 78, 79, 83, 84, 85, 100, 102, 103, 104, 107, 121, 127, 136, 138, 143, 144, 145, 152, 163
- n*th order, 80, 82, 83, 84
- single, 75, 79, 83, 84, 100, 101, 102, 103, 107, 121, 127, 135, 136, 143
- triple, 79, 80, 83, 84, 145
- Classical theory, 10, 11, 12, 13, 14, 16, 18, 34, 67
- Complete ordered field, 59, 63
- Composition rules, 157
- Concatenation, 32, 33, 34, 37, 68, 85, 86
- Conjoint measurement, 35, 67, 68–87, 97, 98, 99, 100, 102, 113, 120–127, 133–147, 149, 152, 153, 156, 157, 163, 165
- Connexity, 92, 166, 167, 170
- strong, 29, 30, 32, 52, 92, 166, 167, 168, 170
- Counting, 56

## D

- Dedekind cut, 59, 60, 61
- Density, 13, 14, 34, 35, 55, 69, 78, 79
- Density condition, 56, 57, 73
- Derived measurement, 13, 14, 15, 35
- Dissimilarity, 110, 112, 116, 117, 119, 121, 123, 125, 127
- Distance metric, 115, 119



**E**

- Empirical character of numbers, 12, 19, 49, 58, 63
- Empirical relational system, 30, 31, 33, 34, 35, 38, 39, 40, 44, 45, 48, 158, 159, 160
- Euclidean theory, 9, 10, 54, 61
- Euclidean distance, 115
- Experimental method, 6, 7, 86, 150
- Exponential metric, 116
- Extensive, 10, 11, 13, 34, 35, 67, 68, 85, 86, 160, 163

**F**

- Factor analysis, 7, 153, 155, 156
- Fundamental measurement, 13, 14, 15, 20, 35, 46, 65

**G**

- Group, 161-162
- Guttman scale, 173-175

**H**

- Hardness, 39, 41, 42, 44
- Homogeneity, 158, 160, 161
- Homomorphism, 31, 33, 36, 37

**I**

- Independence, *see* Cancellation conditions, single

- Instrumentalism, 34, 40

- Intelligence, *see also* Mental ability, 25
- Intensive, 11

- Interdimensional additivity, 115, 117, 123, 127
- Interval order, 169, 170, 172, 173, 174, 175
- Intradimensional subtractivity, 115, 116, 117, 120, 121, 123, 127, 133
- Intransitivity, 140, 166

- Irreflexivity, 166, 167, 168

- Isomorphism, 31, 57, 158, 160

**O**

- Operationalism, 15, 16, 18, 23, 24, 25, 26, 27, 28, 44, 53, 150
- Order, 16, 51, 52, 165-175

**P**

- Partial order, 167, 168, 170, 172
- Permissible statistics, 40-46
- Philosophy of science, 28, 29
- Physics, 5, 24, 34, 86, 165
- Positivity, 53, 115
- Power metrics, 115, 116, 118, 121, 123
- Preorder, *see* Weak order
- Properties, 51, 52, 53, 54, 78
- Psychometrics, 18, 170
- Psychophysics, 9, 15, 19, 91, 94, 109, 149, 152
- Pythagoreanism, 5, 8, 164

**Q**

- Qualities, 5, 8, 10, 11, 18
- Quantification, 12, 15, 55, 64, 68, 73, 79, 86, 165
- Quantitative imperative, 5, 6, 8, 9, 12, 15
- Quantitative variable, 8, 13, 25, 51-55, 65, 67, 68, 78-79, 107, 129, 131, 139, 159, 163, 167
- Quantity, 5, 8, 9, 10, 12, 18, 19, 51-63, 65, 67, 77, 156, 158, 165, 170
- continuous, 10, 11, 56-63
- discrete, 10, 56
- Quasi-order, 167

**R**

- Rating scales, 19, 125, 152
- Ratios, 10, 11, 12, 16, 58, 59, 60, 62, 63, 64, 65, 163, 164
- Real unit structure, 161, 162-163
- Reflexivity, 59, 166, 168, 170, 172
- Relation, 17, 24, 28, 30, 39-40, 48, 51-52, 54, 78, 165-175
- Representation, 31, 34, 35, 36, 49
- Representational theory, 16, 18, 23, 24, 28-49, 63, 130

**U**

- Unboundedness condition, 61
- Unfolding theory, 129-147, 149, 152
- Uniformities of coexistence, 13, 53, 55
- Uniqueness, 158, 160, 161
- Uniqueness problem, 36
- Unit of measurement, 12, 56, 64, 97

**S**

- Scales, 31, 35-40, 158, 161
- interval, 17, 37, 38, 158, 159, 161
- nominal, 16, 34, 36, 37, 38, 39, 40, 158
- ordinal, 16, 31, 36, 37, 39, 41, 42, 43, 44, 46, 158, 159, 161
- ratio, 17, 31, 34, 37, 38, 39, 40, 41, 43, 44, 158, 159, 163
- Segmental additivity, 116
- Semiorder, 169, 172, 174, 175
- Sensations, intensity of, 7, 12, 15, 19, 25
- Similarity, 109, 110, 111, 112, 113, 114, 116, 117, 118, 119
- Simple order, 52, 167, 170
- Solvability condition, 53, 69, 73, 74, 75, 76, 77, 79, 84, 85, 163
- Space, 24, 56, 110, 113, 114
- Standard sequence, 76, 77, 84, 139
- Stevens' theory, 15, 16, 19, 23, 29, 34
- definition of measurement, 18, 20, 23
- scale types, 16, 17, 31, 34, 36, 37, 38, 40
- doctrine of permissible statistics, 17, 43, 45, 46, 49
- Strict partial order, 169, 170, 172, 173
- Strict simple order, 167, 170, 173
- Symmetry, 59, 115, 166

**T**

- Temperature, 11, 16, 17, 38, 170
- Theoretical concepts, 25, 27
- Thurstone's theory of comparative judgment 91-107, 109, 120, 129, 151
- Time, 24, 34, 56, 68
- Translations, 161
- Transitivity, 30, 52, 70, 92, 102, 107, 166-169, 170, 172
- Triangle inequality, 115, 119

190 SUBJECT INDEX

**V**

Validity of inferences, 40, 41, 42, 43, 45-46,

49

Variable, 18, 19, 20, 78

Velocity, 12, 52, 85-86

Verificationism, 13, 14, 15, 44

Volume, 14, 16, 17, 35, 38, 68, 69,

79

**W**

Weak order, 167, 168, 170, 175

Weight, 32, 34, 36, 37, 39, 41, 68, 114