

## REFERENCES - SECTION 1

- 1.1- Georgi, H. and Glashow, S.L., "Unity of All Elementary-Particle Forces," Phys. Rev. Lett., 32, 938 (1974).
- 1.2- Commins, E.D. and Bucksbaum, P.H., Weak Interactions of Leptons and Quarks, Cambridge (1983), pg. 425.
- 1.3- See eg., Georgi, H., Quinn, H.R. and Weinberg, S., "Hierarchy of Interactions in Unified Gauge Theories," Phys. Rev. Lett., 451 (1974) at 453, which suggests that spontaneous G.U.T. symmetry breaking may help to establish the gravitational interaction scale. See also Weinberg, S., "Grand Unification," in Ne'eman, Y., ed., To Fulfill a Vision: Jerusalem Einstein Centennial Symposium on Gauge Theories and Unification of Physical Forces, Addison-Wesley (1981), pp. 202-205 and 208-209.
- 1.4- Penrose, R. and Rindler, W., Spinors and Spacetime, Volume 1, Cambridge (1984), pg. vii.
- 1.5- ibid, pg. viii.
- 1.6- Pati, J. and Salam, A., "Lepton Number as the Fourth 'Color'," Phys. Rev. D10, 275 (1974).
- 1.7- Pati, J., "New Physics with Grand Unification," in Ne'eman, Op. Cit. note 2, Section 6.
- 1.8- Halzen F. and Martin A.D., Quarks and Leptons: An Introductory Course in Modern Particle Physics, Wiley (1984), Section 5.7.
- 1.9- Op. Cit. note 2, Section 10.
- 1.10- Op. Cit, Weinberg, note 3, pp. 210-213.
- 1.11- ibid.
- 1.12- See, eg., Pati and Salam, "Is Baryon Number Conserved?," Phys. Rev. Lett., 661 (1973).
- 1.13- Op. Cit., note 1.4.
- 1.14- For the reader who may wish to review this area, one of the leading introductions to the spinor calculus is given in Misner, C., Thorne, K., Wheeler, J., Gravitation, Freeman (1973), Section 41.
- 1.15- See for example Halzen and Martin, Op. Cit. note 1.8, Sections 5,6.
- 1.16- One of the leading introductions to general relativity and general covariance is Ohanian, H.C., Gravitation and Spacetime, Norton (1976).

REFERENCES - SECTION 1 (CONTINUED)

- 1.17- Minkowski, H., "Space and Time", Address at 80th Assembly of German Natural Scientists and Physicians, in The Principle of Relativity, Dover (1952). (1908)
- 1.18- Einstein, A., "On the Electrodynamics of Moving Bodies", *Annalen der Physik*, 17, 1905, in Op. Cit. note 1.17.
- 1.19- Einstein, A., "The Foundation of the General Theory of Relativity", *Annalen der Physik*, 49, 1915, in Op. Cit. note 1.17.
- 1.20- See Pais, A., 'Subtle is the Lord...' The Science and the Life of Albert Einstein, Oxford (1982), pg. 330.
- 1.21- The key "seeds" for this sort of approach are provided by discussions in Halzen and Martin, Op. Cit., note 1.8, on pp. 50, 92, 150.
- 1.22- The possible existence of Boson chiral projections is noted in Harari, H., "Quarks and Leptons: The Generation Puzzle", in Ne'eman, ed., Op. Cit., note 1.3, pg. 173.
- 1.23- *ibid*, pg. 177. See also Op. Cit., notes 1.6, 1.7. at 226.
- 1.24- Langacker, P., "Grand Unified Theories and Proton Decay", *Phys. Rep.* 72C, 185 (1981), pp. 247,248.
- 1.25- Weinberg, Op. Cit. note 1.3, pp. 203-205.
- 1.26- Halzen and Martin, Op. Cit. note 1.8, Section 15.7.

REFERENCES - SECTION 2

- 2.1- Op. Cit. note 1.24, eq. (2.240).
- 2.2- Op. Cit. note 1.8, Section 3.5.
- 2.3- Op. Cit. note 1.20.
- 2.4- Op. Cit., note 1.8, Section 4.7.
- 2.5- *ibid*, Section 2.7.
- 2.6- Op. Cit. note 1.4.
- 2.7- *ibid*.
- 2.8- Weinberg, Op. Cit. note 1.3, pp. 210-213.
- 2.9- Pati, Op. Cit. note 1.7, pg. 223.
- 2.10- *ibid*.
- 2.11- *ibid*.
- 2.12- Op. Cit., note 1.4.
- 2.13- Op. Cit., note 1.8, eq. (13.42).
- 2.14- *ibid*, Sections 15.7, 15.8. Also, Weinberg, Op. Cit., note 1.3, eq. (15.7).
- 2.15- Penrose and Rindler, Op. Cit. note 1.4.
- 2.16- Op. Cit. notes 1.6, 1.7.
- 2.17- Op. Cit. note 2.9.
- 2.18- Op. Cit. notes 1.6, 1.7. See also Langacker, Op. Cit. note 1.24, pp. 239-240.
- 2.19- Op. Cit. note 1.2, pg. 144, for example.
- 2.20- All we are really doing here is quoting a well known result, for example, in Halzen and Martin, Op. Cit. note 1.8, eq. (15.25).
- 2.21- Op. Cit., note 1.22, pg. 172.
- 2.22- Op. Cit. note 1.8, pp. 285, 286.

REFERENCES - SECTION 2 (CONTINUED)

- 2.23 - Op. Cit. note 1.22. pg. 177. Also, Op. Cit note 1.6, and 1.7 at 226.
- 2.24 - *ibid.*
- 2.25 - Lee, T.D. and Yang, C.N., "Conservation of Heavy Particles and Generalized Gauge Transformations", *Phys. Rev.* 98, 1501 (1955).
- 2.26 - For an example of how mass scales may be tied to the Cabibbo mixing angles, see for example Op. Cit. note 1.8, eq. (12.107) and related discussion.
- 2.27 - *ibid.*
- 2.28 - *ibid.*, pp. 59, 282-283.

## BIBLIOGRAPHY

### Books and Monographs

- Commins, E.D. and Bucksbaum, P.H., Weak Interactions of Leptons and Quarks, Cambridge, (1983)
- Dodd, J.E., The Ideas of Particle Physics, An Introduction for Scientists, Cambridge (1984)
- Einstein, A., The Principle of Relativity, Dover (1952)
- Halzen, F. and Martin, A.D., Quarks and Leptons: An Introductory Course in Modern Particle Physics, Wiley (1984)
- Hughes, I.S., Elementary Particles, Cambridge, (1985)
- Misner, C.W., Thorne, K.S., Wheeler, J.A., Gravitation, Freeman (1973)
- Ne'eman, Y., ed., To Fulfill a Vision, Jerusalem Einstein Centennial Symposium on Gauge Theories and Unification of Physical Forces, Addison-Wesley (1981)
- Ohanian, H.C., Gravitation and Spacetime, Norton (1976)
- Pais, A., 'Subtle is the Lord...' The Science and the Life of Albert Einstein, Oxford (1982)
- Penrose, R. and Rindler, W., Spinors and Spacetime, Volume 1, Two-Spinor Calculus and Relativistic Fields, Cambridge (1984)

### Articles and Papers

- Einstein, A., "The Foundation of the General Theory of Relativity", Annalen der Physik, 49, (1916), in Einstein (1952)
- Einstein, A., "On the Electrodynamics of Moving Bodies", Annalen der Physik, 17, (1905), in Einstein (1952)
- Georgi, H. and Glashow, S.L., "Unity of All Elementary Particle Forces", Phys. Rev. Lett. 32, 438 (1974)
- Georgi, H., Quinn, H.R. and Weinberg, S., "Hierarchy of Interactions in Unified Gauge Theories", Phys. Rev. Lett. 33, 451 (1974)
- Harari, H., "Quarks and Leptons: The Generation Puzzle", Chapter 13 in Ne'eman, Y., ed. (1981)

BIBLIOGRAPHY (CONTINUED)

- Langacker, P., "Grand Unified Theories and Proton Decay", Phys. Rep. 72C, 185 (1981)
- Lee, T.D. and Yang, C.N., "Conservation of Heavy Particles and Generalized Gauge Transformations", Phys. Rev. 98, 1501 (1955)
- Minkowski, H., "Space and Time", Address at 80th Assembly of German Natural Scientists and Physicians (1908), in Einstein (1952)
- Pati, J.C., "New Physics with Grand Unification", Chapter 16 in Ne'eman, Y., ed. (1981)
- Pati, J.C. and Salam, A., "Is Baryon Number Conserved?", Phys. Rev. Lett. 31 (1973)
- Pati, J.C. and Salam, A., "Lepton Number as the Fourth 'Color'", Phys. Rev. D10, 275 (1974)
- Pati, J.C. and Salam, A., "Unified Lepton-Hadron Symmetry and a Gauge Theory of the Basic Interactions", Phys. Rev. D8, 1240 (1973)
- Weinberg, S., "Grand Unification", Chapter 15 in Ne'eman, ed. (1981)
- Weinberg, S., "Recent Progress in Gauge Theories of the Weak, Electromagnetic and Strong Interactions", Rev. Mod. Phys. 46, 255 (1974)

## ACKNOWLEDGEMENTS

The author wishes to thank various faculty members from the physics department at Rensselaer Polytechnic Institute, Troy, New York, for many valuable discussions and suggestions during a series of seminars delivered there by the author, in the spring term of 1986. Also, special acknowledgement must be given to Dr. Hans C. Ohanian of the R.P.I. adjunct faculty, who first helped me to learn general relativity and more importantly, how to apply it. Without his critique and guidance on numerous occasions during my more formative years, it is ~~possible that the present work might never~~ **have been developed.**