Universidade de Coimbra

Faculdade de Ciências e Tecnologia

Departamento de Antropologia

# DIMORFISMO SEXUAL NA ESTATURA, DIMENSÕES E PROPORÇÕES DOS OSSOS LONGOS DOS MEMBROS

## O CASO DE UMA AMOSTRA PORTUGUESA DOS SÉCULOS XIX-XX

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Dissertação de Tese Apresentada à Universidade de Coimbra para a Obtenção do Grau de Mestre em Evolução Humana

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## RESUMO

O principal objectivo do presente trabalho foi a realização de um estudo métrico dos ossos longos dos membros, nomeadamente do úmero, rádio, fémur e tíbia. Pretendeu-se avaliar o grau e padrão de dimorfismo sexual nas dimensões e proporções dos ossos mencionados, a influência desse dimorfismo e proporções na estimativa da estatura e desenvolver métodos de diagnose sexual com base nas medições realizadas.

Neste estudo foi utilizada uma amostra de 200 indivíduos (100 de cada sexo) dos séculos XIX-XX, proveniente da colecção de esqueletos identificados (Colecção Luís Lopes) alojada no Museu e Laboratório Zoológico e Antropológico – Museu Bocage da Universidade de Lisboa.

Antes de proceder ao estudo propriamente dito foi estimado o erro de medição. Os resultados indicam que os dados obtidos são de boa qualidade e apresentam um erro intra-observador.

A análise do dimorfismo sexual nas dimensões dos ossos estudados permitiu averiguar que são as epífises os elementos ósseos, que apresentam diferenças sexuais mais acentuadas. Em relação às proporções dos ossos dos membros, os índices crural e úmero-femoral são aqueles que não apresentam diferenças significativas entre os sexos. A relação entre as variáveis que compõem os índices de proporções revelou-se sempre alométrica, aproximando-se da isometria no caso da relação entre o comprimento do fémur e o comprimento da tíbia. Não foi encontrada qualquer relação entre o comprimento do membro superior e o índice braquial e entre o comprimento do membro superior e o índice crural. Por outro lado, a correlação entre o índice braquial e o índice crural revelou-se positiva e significativa ainda que reduzida.

No que se refere à estimativa da estatura, verificou-se que as diferenças populacionais nas proporções dos membros e no dimorfismo sexual, tanto nas proporções como na estatura, podem influenciar de modo considerável a estatura média estimada de uma população, representada pelos seus restos ósseos. Verificou-se que a utilização de métodos de estimativa da estatura que melhor se ajustam às proporções dos membros da amostra em estudo, podem sobrestimar (ou subestimar) a estatura média real. Por outro lado, os métodos que mais se distanciam das proporções dos membros da amostra podem produzir estimativas mais próximas desse valor real. Verificou-se ainda que o dimorfismo sexual da amostra no comprimento dos ossos longos e o dimorfismo sexual na estatura da amostra que serviu de base à criação dos métodos de estimativa, influenciam as diferenças sexuais que vão ser encontradas na estatura estimada por esses métodos.

Em relação à diagnose sexual foram desenvolvidos métodos univariados, de modo a facilitar a sua aplicação em material ósseo fragmentado. Os métodos criados permitem determinar o sexo de um indivíduo a partir dos seus restos ósseos com uma precisão superior a 80-85 %, utilizando as medições das espífises como variáveis discriminantes. De salientar que as epífises do úmero revelaram-se mais discriminantes que as do fémur. As restantes medidas são menos precisas, em especial aquelas que correspondem aos diâmetros, pois existe uma grande variabilidade inter-sexual para estas variáveis. O comprimento do rádio destaca-se ainda como uma medida que permite diagnosticar o sexo com uma precisão mais elevada do que seria de esperar (85%).

# 8. REFERÊNCIAS BIBLIOGRÁFICAS


Aiello, L. C. (1992). Allometry and the Analysis of Size and Shape in Human Evolution. *Journal of Human Evolution* **22**: 127-147.

Aiello, L. & Dean, C. (1990). *An Introduction to Human Evolutionary Anatomy*. Academic Press, London.

Aléman, I. A.; Botella, M. C. L. & Ruíz, L. R. (1997). Determinación del Sexo en el Esqueleto Postcraneal. Estudio de una Población Mediterránea Actual. *Archivo Español de Morfologia* **2**: 69-79.

Albrecht, G. H.; Gelvin, B. R. & Hartman, S. E. (1993). Ratios as a Size Adjustment in Morphometrics. *American Journal of Physical Anthropology* **91**: 441-468.

Alexander, R. D.; Hoogland, J. L.; Howard, R. D.; Noonan, K. M.; Sherman, P. W. (1979). Sexual Dimorphism and Breeding Systems in Pinnipeds, Ungulates, Primates and Humans. In: Chagnon, N. A. & Irons, W. (eds.). *Evolutionary Biology and Human Social Behavoir. An Anthropological Perspective*. Duxbury Press, Massachusetts. Pp. 402-435.

Almaça, C. & Neves, A. M. (1987). The Museu Bocage and the New Series of its Arquivos. *Arquivos do Museu Bocage* **1**(1): 1-8.

Armelagos, G. J. & van Gerven, D. P. (1980). Sexual Dimorphism and Human Evolution: An Overview. *Journal of Human Evolution* **9**: 437-446.

Asfaw, B.; White, T.; Lovejoy, O.; Latimer, B.; Simpson, S. & Suwa, G. (1999). Australopithecus garhi: a New Species of Early Hominid from Ethiopia. *Science* **284**: 629-635.

Atchley, W. R. & Anderson, D. (1976). Ratios and the Statistical Analysis of Biological Data. *Systematic Zoology* **27**(1): 71-78.

Atchley, W. R.; Gaskins, C. T. & Anderson, D. (1976). Statistical Properties of Ratios. I. Empirical Results. *Systematic Zoology* **25**(2): 137-148.

Bach, H. (1965). Zur Berechnung der Körperhöhe aus den langen Gliedma enknochen weiblicher Skelette. *Anthropologischer Anzeiger* **29**: 12-21.

Bailey, R. C. & Byrnes, J. (1990). A New, Old Method for Assessing Measurement Error in Both Univariate and Multivariate Morphometric Studies. *Systematic Zoology* **39**(2): 124-130.

Baker, P. T. (1992). Human Adaptations to the Physical Enviroment. In: Jones, S.; Martin, R. & Pilbeam, D. (eds.). *The Cambridge Encyclopedia of Human Evolution.* Cambridge University Press, Cambridge. Pp. 46-51.

Bass, W. M. (1995). *Human Osteology, a Laboratory and Field Manual.* Missouri Archaeological Society, Inc., Columbia.

Bennett, K. A. (1981). On the Expression of Sex Dimorphism. *American Journal of Physical Anthropology* **56**: 59-61.

Berrizbeitia, E. (1989). Sex Determination with the Head of the Radius. *Journal of Forensic Sciences* **34**(5): 1206-1213.

Biasutti, R. (1951). Radio-Humeral and Tibio-Femoral Indexes in Fossil and Living Man. *Homo* **2**: 97-99.

Black III, T. K. (1978): A New Method for Assessing the Sex of Fragmentary Skeletal Remains in Femoral Shaft Circumference. *American Journal of Physical Anthropology* **48**: 227-231.

Boddington, A. (1987). From Bones to Population: the Problem of Numbers. In: Boddington, A.; Garland, A. E. & Janaway, R. C. (eds.). *Death, Decay and Reconstruction. Approaches to Archaeology and Forensic Science.* Manchester University Press, Manchester. Pp. 181-197.

Borgognini Tarli, S. M. & Repetto, E. (1986). Methodological Considerations on the Study of Dimorphism in Past Human Populations. In: Pickford, M. & Chiarelli, B. (eds.). *Sexual Dimorphism in Living and Fossil Primates.* Il Sedicesimo, Firenze. Pp. 51-66.

Brace, C. L. (1973). Sexual Dimorphism in Human Evolution. In: Brace, C. L. & Metress, J. (eds.). *Man in Evolutionary Perspective.* John Wiley and Sons Inc., New York. Pp. 238-254.

Breitinger, E. (1938). Zur Berechnung der Körperhöhe aus den langen Gliedmaβenknochen. *Anthropologischer Anzeiger* **14**: 249-274.

Branson, R. S.; Vaucher, Y. E.; Harrison, G. G.; Vargas, M. & Thies, C. (1982). Inter- and Intra-Observer Reliability of Skinfold Thickness Measurements in Newborn Infants. *Human Biology* **54**(1): 137-143.

Brown, F.; Harris, J.; Leakey, R. & Walker, A. (1985). Early Homo erectus Skeleton from West Lake Turkana, Kenya. *Nature* **316**: 788-792.

Brues, A. (1959). The Spearman and the Archer - An Essay on Selection in Body Build. *American Anthropologist* **61**: 457-469.

Bruzek, J. (1991). *Fiabilité des Procédés de Détermination du Sexe à partir de l'Os Coxal. Implications à l'Étude du Dimorphisme Sexuel de l'Homme Fossile.* Thésis de Doctorat. Muséum National d'Histoire Naturelle, Institut de Paleontologie Humaine, Paris.

Bruzek, J. (1995). Diagnose Sexuelle à l'aide de l'Analyse Discriminant Appliquée au Tibia. *Antropologia Portuguesa* **13**: 93-106.

Buikstra, J. E. & Ubelaker, D. H. (1994). *Standards for Data Collection from Human Skeletal Remains*. Arkansas Archaeological Survey, Fayetteville.

Cameron, N.; Tanner, J. M. & Whitehouse, R. H. (1982). A Longitudinal Analysis of the Growth of Limb Segments in Adolescence. *Annals of Human Biology* **9**(3): 211-220.

Cardoso, H. & Cunha, E. (s.d. a). On the Applicability of Some Femur Measurements for Sex Diagnosis. In: *Actas do XI Congreso de la Sociedad Española de Antropología Biológica.* (submetido a publicação).

Cardoso, H. & Cunha, E. (s.d. b). Sexual Dimorphism in Upper Limb Skeletal Proportions. *Biométrie Humaine & Anthropologie* (submetido a publicação).

Carretero, J. M.; Lorenzo, C. & Arsuaga, J. L. (1995). Análisis Multivariante del Húmero. *Antropologia Portuguesa* **13**: 139-156.

Caspari, R. (1992). Skeletal Reflections of Increased Mobility in the Central European Upper Paleolithic.(Abstract). *American Journal of Physical Anthropology* **14**(Suppl.): 58.

Chakraborty, R. & Majumder, P. P. (1982). On Bennett's Measure of Sex Dimorphism. *American Journal of Physical Anthropology* **59**: 295-298.

Chandler, P. J. & Bock, R. D. (1991). Age Changes in Adult Stature: Trend Estimation from Mixed Longitudinal Data. *Annals of Human Biology* **18**(5): 433-440.

Charzewski, J. & Bielicki, T. (1978). Is the Secular Trend in Stature Associated with Relative Elongation of the Limbs? *Homo* **29**: 176-181.

Chatfield, C. & Collins, A. J. (1980). *Introduction to Multivariate Analysis*. Chapman & Hall, London.

Chayes, F. (1949). On Ratio Correlation in Petrography. *The Journal of Geology* **57**: 239-254.

Cline, M. G.; Meredith, K. E.; Boyer, J. T. & Burrows, B. (1989). Decline in Height with Age in Adults in a General Population Sample: Estimating Maximum Height and Distinguishing Birth Cohort Effects from Actual Loss of Stature with Aging. *Human Biology* **61**(3): 415-425.

Collier, S. (1993). Sexual Dimorphism in Relation to Big-Game Hunting and Economy in Modern Human Populations. *American Journal of Physical Anthropology* **91**: 485-504.

Coma, J. M. R. (1999). *Antropologia Forense*. Ministerio de Justicia, Madrid.

Constandse-Westermann, T. S.; Blok, M. L. & Newell, R. R. (1985). Long Bone Length and Stature in the Western European Mesolithic. I. Methodological Problems and Solutions. *Journal of Human Evolution* **14**: 399-410.

Corrucini, R. S. (1995). Of Ratios and Rationality. *American Journal of Physical Anthropology* **96**: 189-191.

Cunha, E. (1989). *Cálculo de Funções Discriminantes para a Daignose Sexual do Crânio*. Provas de Aptidão e Capacidade Científica, Trabalho de Síntese. Departamento de Antropologia da Faculdade de Ciências e Tecnologia da Universidade de Coimbra, Coimbra.

Cunha, E. (1994). *Paleobiologia das Populações Medievais Portuguesas*. Tese de Doutoramento. Departamento de Antropologia da Faculdade de Ciências e Tecnologia da Universidade de Coimbra, Coimbra.

Cunha, E. (1996). Viajar no Tempo através dos Ossos. A Investigação Paleobiológica. *al-madam* **5**: 131-141.

Cunha, E. & van Vark, G. N. (1991). The Construction of Sex Discriminant Functions from a Large Collection of Skulls of Known Sex. *International Journal of Anthropology* **6**(1): 53-66.

Davenport, C. B. (1933). The Crural Index. *American Journal of Physical Anthropology* **17**: 333-352.

DiBennardo, R. (1986). The Use and Interpretation of Common Computer Implementations of Discriminant Function Analysis. In: Reichs, K. J. (ed.).

*Forensic Osteology. Advances in the Identification of Human Remains.* Charles C. Thomas Publisher, Springfield, Illinois. Pp. 101-111.

DiBennardo, R. & Taylor, J. V. (1979): Sex Assessment of the Femur: A Test of a New Method. *American Journal of Physical Anthropology* **50**: 635-638.

DiBennardo, R. & Taylor, J. V. (1982): Classification and Misclassification in Sexing the Black Femur by Discriminant Function Analysis. *American Journal of Physical Anthropolology* **58**: 145-151.

DiBennardo, R. & Taylor, J. V. (1983): Multiple Discriminant Function Analysis of Sex and Race in the Postcranial Skeleton. *American Journal of Physical Anthropology* **61**: 305-314.

Dinkel, C. A.; Wilson, L. L.; Tuma, H. J. & Minyard, J. A. (1965). Ratios and Percentages as Measures of Carcass Traits. *Journal of Animal Science* **24**: 425-429.

Dittrick, J. & Suchey, J. M. (1986): Sex Determination of Prehistoric Central California Skeletal Remains using Discriminant Analysis of the Femur and Hutnerus. *American Journal of Physical Anthropology* **70**: 3-9.

Duarte, C.; Maurício, J.; Pettitt, P. B.; Souto, P.; Trinkaus, E.; Plicht, H. & Zilhão, J. (1999). The Early Upper Paleolithic Human Skeleton from the Abrigo do Lagar Velho (Portugal) and Modern Human Emergence in Iberia. *Proceedings of the National Academy of Sciences of the USA* **96**: 7604-7609.

Dupertius, C. W. & Hadden Jr., J. A. (1951). On the Reconstruction of Stature from Long Bones. *American Journal of Physical Anthropology* **9**: 15-54.

Eveleth, P. B. & Tannet, J. M. (1990). *Worldwide Variation in Human Growth.* Cambridge University Press, Cambridge.

Feldesman, M. R. & Lundy, J. K. (1988). Stature Estimates for some African Plio-Pleistocene Fossil Hominids. *Journal of Human Evolution* **17**: 583-596.

Ferembach, D.; Schwidetzky, I. & Stloukal, M. (1980). Recommendations for Age and Sex Diagnoses of Skeletons. *Journal of Human Evolution* **9**: 517-549.

Finkel, D. J. (1982). Sexual Dimorphism and Settlement Pattern in Middle Eastern Skeletal Populations. In: Hall, R. L. (ed.). *Sexual Dimorphism in Homo Sapiens. A Question of Size.* Praeger Publishers, New York. Pp. 165-185.

Firebaugh, G. & Gibbs, J. P. (1985). User's Guide to Ratio Variables. *American Sociological Review* **50**: 713-722.

Fleagle, J. (1988). *Primate Adaptation and Evolution.* Academic Press Inc., San Diego.

Foley, R. (1987). *Another Unique Species. Patterns in Human Evolutionary Ecology.* Longman Scientific & Technical, Harlow.

Formicola, V. (1983). Stature in Italian Prehistoric Samples, with Particular Reference to Methodological Problems. *Homo* **34**: 33-47.

Formicola, V. & Franceschi, M. (1996). Regression Equations for Estimating Stature from Long Bones of Early Holocene European Samples. *American Journal of Physical Anthropology* **100**: 83-88.

Formicola, V. & Giannecchini, M. (1999). Evolutionary Trends of Stature in Upper Paleolithic and Mesolithic Europe. *Journal of Human Evolution* **36**: 319-333.

Frampton, C. M. & Ward, J. M. (1990). The Use of Ratio Variables in Systematics. *Taxon* **39**(4): 586-592.

France, D. L. (1988). Osteometry at Muscle Origin and Insertion in Sex Determination. *American Journal of Physical Anthropology* **76**: 515-526.

Frayer, D. W. (1980). Sexual Dimorphism and Cultural Evolution in the Late Pleistocene and Holocene of Europe. *Journal of Human Evolution* **9**: 339-415.

Frayer, D. W. (1981). Body Size, Weapon Use, and Natural Selection in the European Upper Paleolithic and Mesolithic. *American Anthropologist* **83**: 57-73.

Frayer, D. W. & Wolpoff, M. H. (1985). Sexual Dimorphism. *Annual Review of Anthropology* **14**: 429-473.

Frayer, D. W.; Wolpoff, M. H.; Thorne, A. G.; Smith, F. H. & Pope, G. G. (1993). Theories of Modern Human Origins: The Paleontological Test. *American Anthropologist* **95**(1): 14-50.

Fully, G. (1956). Une Nouvelle Méthode de Détermination de la Taille. *Annales de Médecine Légale et Criminologie* **36**(5): 266-273.

Garralda, M. D. & Vandermeersch, B. (1993). L'Évolution de la Stature. *Bulletins et Mémoires de la Société de Anthroplogie de Paris* **5**: 269-281.

Gaulin, S. J. & Boster, J. (1985). Cross-Cultural Differences in Sexual Dimorphism. Is There Any Variance to be Explained. *Ethology and Sociobiology* **6**: 219-225.

Gaulin, S. J. C. & Boster, J. S. (1992). Human Marriage Systems and Sexual Dimorphism in Stature. *American Journal of Physical Anthropology* **89**: 467-475.

Gelvin, B. R. (1985). Problems with Using Ratios for Scaling of Morphometric Data. *American Journal of Physical Anthropology* **66**: 173.

Gelvin, B. R. (1991). The Theory and Practice of Using Ratios as Size-Adjustment. *American Journal of Physical Anthropology* **12**(Suppl.): 77-78.

Genovés, S. (1967). Proportionality of the Long Bones and their Relation to Stature among Mesoamericans. *American Journal of Physical Anthropology* **26**: 67-77.

Gilbert, N. (1989). *Biometrical Interpretation. Making Sense of Statistics in Biology*. Oxford University Press, Oxford.

Gindhart, P. S. (1973). Growth Standards for the Tibia and Radius in Children Aged One Month through Eighteen Years. *American Journal of Physical Anthropology* **39**: 41-48.

Gould, S. J. (1966). Allometry and Size in Ontogeny and Phylogeny. *Biological Reviews of the Cambridge Philosophical Society* **41**: 587-640.

Gray J. P. & Wolfe, L. D. (1980). Height and Sexual Dimorphism of Stature Among Human Societies. *American Journal of Physical Anthropology* **53**: 441-456.

Hall, R. L. (1978). Sexual Dimorphism for Size in Seven Nineteenth Century Northwest Coast Populations. *Human Biology* **50**(2): 159-171.

Hamilton, M. E. (1982). Sexual Dimorphism in Skeletal Samples. In: Hall, R. L. (ed.). *Sexual Dimorphism in Homo Sapiens. A Question of Size*. Praeger Publishers, New York. Pp. 107-163.

Hernandez, M.; Perez-Perez, A. & Jimenez, S. (1991). Dimorfismo Sexual y Assimetria de Humero y Femur en Poblaciones de la Peninsula Iberica. In: Botella, M. C.; Jimenez, S. A.; Ruiz, L. & DuSouich. (eds.). *Nuevas Perspectivas en Antropologia*. Laboratorio de Antropologia, Dpto Ciências Morfológicas, Facultad de Medicina, Univeridad de Granada, Granada. Pp. 387-400.

Hildebrand, M. (1974). *Analysis of Vertebrate Structure*. John Wiley & Sons, New York.

Hilton, C. E. (1989). The Swing Phase of Walking in Neandertals and Modern Humans. *American Journal of Physical Anthropology* **78**: 241.

Holden, C. & Mace, R. (1999). Sexual Dimorphism in Stature and Women's Work: A Phylogenetic Cross-Cultural Analysis. *American Journal of Physical Anthropology* **110**: 27-45.

Holland, T. D. (1991). Sex Assessment Using the Proximal Tibia. *American Journal of Physical Anthropology* **85**: 221-227.

Holliday, T. W. (1995). *Body Size and Proportions in the Late Pleistocene Western Old World and the Origins of Modern Humans*. Tese de Doutoramento. University of New Mexico, Albuquerque.

Holliday, T. W. (1997a). Body Proportions in Late Pleistocene Europe and Modern Human Origins. *Journal of Human Evolution* **32**: 423-447.

Holliday, T. W. (1997b). Postcranial Evidence of Cold Adaptation in European Neandertals. *American Journal of Physical Anthropology* **104**: 245-258.

Holliday, T. W. (1999). Brachial and Crural Indices of European Late Upper Paleolithic and Mesolithic Humans. *Journal of Human Evolution* **36**: 549-566.

Holliday, T. W. & Falsetti, A. B. (1995). Lower Limb Length of European Early Modern Humans in Relation to Mobility and Climate. *Journal of Human Evolution* **29**: 141-153.

Holliday, T. W. & Trinkaus, E. (1991). Limb/Trunk Proportions in Neanderthals and Early Anatomically Modern Humans. (Abstract). *American Journal of Physical Anthropology* **12**(Suppl.): 93.

Holman, D. J. & Bennett, K. A. (1991). Determination of Sex from Arm Bone Measurements. *American Journal of Physical Anthropology* **84**: 421-426.

Hrdlicka, A. (1947). *Practical Anthropometry*. Wistar Institute, Philadelphia.

Hunter, J. S. (1980). The National System of Scientific Measurement. *Science* **210**: 869-874.

Introna Jr., F.; Dragone, M. & Colonna, M. (1993). Determinazione Scheletrica del Sesso Mediante Misurazioni del Radio. *Zachia* **11**(1-2): 159-172.

Iscan, M. Y. (1988). Rise of Forensic Anthropology. *Yearbook of Physical Anthropology* **31**: 203-230.

Iscan, M. Y. & Kennedy, K. A. R. (eds.). (1989). *Reconstruction of Life from the Skeleton*. Alan R. Liss, Inc., New York.

Iscan, M. Y. & Loth, S. R. (1989). Osteological Manifestations of Age in the Adult. In: Iscan, M. Y. & Kennedy, K. A. R. (eds.). *Reconstruction of Life from the Skeleton*. Alan R. Liss, Inc., New York. Pp. 23-40.

Iscan, M. Y.; Loth, S. R.; King, C. A.; Shihai, D. & Yoshino, M. (1998). Sexual Dimorphism in the Humerus: A Comparative Analysis of Chinese, Japanese and Thais. *Forensic Science International* **98**: 17-29.

Iscan, M. Y. & Miller-Shaivitz, P. (1984). Determination of Sex from the Tibia. *American Journal of Physical Anthropology* **64**: 53-57.

Iscan, M. Y. & Miller-Shaivitz, P. (1986). Sexual Dimorphism in the Femur and Tibia. In: Reichs, K. J. (ed.). *Forensic Osteology. Advances in the Identification of Human Remains*. Charles C. Thomas Publisher, Springfield, Illinois. Pp. 101-111.

Iscan, M. Y. & Shihai, D. (1995). Sexual Dimorphism in the Chinese Femur. *Forensic Science International* **74**: 79-87.

Jamison, P. L. & Zegura, S. L. (1974). A Univariate and Multivariate Examination of Measurement Error in Anthropometry. *American Journal of Physical Anthropology* **40**: 197-204.

Jantz, R. L. (1992). Modification of the Trotter & Gleser Female Stature Estimation Formulae. *Journal of Forensic Sciences* **37**(5): 1230-1235.

Jantz, R. L.; Hunt, D. R. & Meadows L. (1994). Maximum Length of the Tibia: How Did Trotter Measure It. *American Journal of Physical Anthropology* **93**: 525-528.

Jantz, R. L.; Hunt, D. R. & Meadows L. (1995). The Measure and Mismeasure of the Tibia: Implications for Stature Estimation. *Journal of Forensic Sciences* **40**(5): 758-761.

Jantz, L. M. & Jantz, R. L. (1999). Secular Change in Long Bone Length and Proportion in the United States, 1800-1970. *American Journal of Physical Anthropology* **110**: 57-67.

Jantz, R. L. & Owsley, D. W. (1984). Temporal Changes in Limb Proportionality among Skeletal Samples of Arikara Indians. *Annals of Human Biology* **11**(2): 157-163.

Johanson, D. C.; Masao, F. T.; Eck, G. G.; White, T. D.; Walter, R. C.; Kimbel, W. H.; Asfaw, B.; Manega, P.; Ndessokia, P. & Suwa, G. (1987). New Partial Skeleton of Homo habilis from Olduvai Gorge, Tanzania. *Nature* **327**: 205-209.

Johanson, D. C. & Taieb, M. (1976). Plio-Pleistocene Hominid Discoveries in Hadar, Ethiopia. *Nature* **260**: 293-297.

Johnson, R. A. & Wichern, D. W. (1998). *Applied Multivariate Statistical Analysis*. Prentice Hall, Upper Saddle River, New Jersey.

Johnston, F. E. & Zimmer, L. O. (1989). Assessment of Growth and Age in the Immature Skeleton. In: Iscan, M. Y. & Kennedy, K. A. R. (eds.). *Reconstruction of Life from the Skeleton*. Alan R. Liss, Inc., New York. Pp. 11-21.

Jungers, W. L. (1982). Lucy's Limbs: Skeletal Allometry and Locomotion in Australopithecus afarensis. *Nature* **297**: 676-678.

Jungers, W. L. (1984a). Body Size and Scaling of Limb Proportions in Primates. In: Jungers, W. L. (ed.). *Size and Scaling in Primate Biology*. Plenum Press, New York. Pp. 345-381.

Jungers, W. L. (1984b). Aspects of Size and Scaling in Primate Biology With Special Reference to the Locomotor Skeleton. *Yearbook of Physical Anthropology* **27**: 73-97.

Jungers, W. L. & Stern, J. T. (1983). Body Proportions, Skeletal Allometry and Locomotion in the Hadar Hominids: A Reply to Wolpoff. *Journal of Human Evolution* **12**: 673-684.

Kaufmann, H. & Anker, P. (1961). L'Indice Radio-Huméral; Nécessité d'une Standardisation. *Archives Suisses d'Anthropologie Générale* **26**(1-2): 1-11.

King, C. A.; Iscan, M. Y.; Loth, S. R. (1998): Metric and Comparative Analysis of Sexual Dimorphism in the Thai Femur. *Journal of Forensic Sciences* **43**(5): 954-958.

Konigsberg, L. W. & Frankenberg, S. R. (1994). Paleodemography: "Not Quite Dead". *Evolutionary Anthropology* **3**(3): 92-105.

Korey, K. A. (1990). Deconstructing Reconstruction: The OH 62 Humerofemoral Index. *American Journal of Physical Anthropology* **83**: 25-33.

Krantz, G. S. (1982). The Fossil Record of Sex. In: Hall, R. L. (ed.). *Sexual Dimorphism in Homo Sapiens. A Question of Size.* Praeger Publishers, New York. Pp. 85-105.

Krogman, W. M. & Iscan, M. Y. (1986). *The Human Skeleton in Forensic Medicine.* Charles C. Thomas, Springfield, Illinois.

Kronmal, R. A. (1993). Spurious Correlation and the Fallacy of the Ratio Standard Revisited. *Journal of the Royal Statistical Society (Series A)* **156**(*Part 3*): 379-392.

Kuh, E. & Meyer, J. R. (1955). Correlation and Regression Estimates when the Data are Ratios. *Econometrica* **23**: 400-416.

Lacerda, J. (1904). *Estatura do Português Adulto.* Dissertação para a Cadeira de Antropologia. Universidade de Coimbra (Manuscripto).

Lalueza-Fox, C. (1998). Stature and Sexual Dimorphism in Ancient Iberian Populations. *Homo* **49**: 260-272.

Lande, R. (1977). On Comparing Coefficients of Variation. *Systematic Zoology* **26**: 214-217.

Larsen, C. S. (1997). *Bioarchaeology. Interpreting Behavior from the Human Skeleton.* Cambridge University Press, Cambridge.

Lewin, R. (1998). *Principles of Human Evolution.* Blackwell Science Inc., Massachusetts.

Lieberman, D. E. (1997). Making Behavioral and Phylogenetic Inferences from Hominid Fossils: Considering the Developmental Influence of Mechanical Forces. *Annual Review of Anthropology* **26**: 185-210.

Low, W. D. (1978). Growth of the Upper Limb, Arm and Forearm in Chinese Children. *Zeitschrift fur Morphologie und Anthropologie* **69**: 172-182.

Lundy, J. K. (1983). Regression Equations for Estimating Living Stature from Long Limb Bones in South African Negro. *South African Journal of Science* **79**: 337-338.

Lundy, J. K. & Feldesman M. R. (1987). Revised Equations for Estimating Living Stature from the Long Bones of the South African Negro. *South African Journal of Science* **83**:54-55.

Macho, G. A. (1990). Is Sexual Dimorphism in the Femur a "Population Specific Phenomenon"? *Zeitschrift fur Morphologie und Anthropologie* **78**: 229-242.

Madansky, A. (1964). Spurious Correlation Due to Deflating Variables. *Econometrica* **32**: 652-655.

Marini, E.; Racugno, W. & Borgognini Tarli, S. M. (1999). Univariate Estimates of Sexual Dimorphism: The Effects of Intrasexual Variability. *American Journal of Physical Anthropology* **109**: 501-508.

Martin, R. (1914). *Lehrbuch der Anthropologie, in Systematischer Darstellung mit Besonderer Berucksichtigung der Anthropologischen Methoden für Studierende Aazte und Forschungsreisende.* Verlag von Gustav Fisher, Jena.

Martin, R. (1928). *Lehrbuch der Anthropologie, in Systematischer Darstellung mit Besonderer Berucksichtigung der Anthropologischen Methoden für Studierende.* Verlag von Gustav Fisher, Jena.

Martin, R. & Saller, K. (1957). *Lehrbuch der Anthropologie, in Systematischer Darstellung mit Besonderer Berucksichtigung der Anthropologischen Methoden.* Gustav Fisher Verlag, Stuttgart.

Martin, R. D. (1990). *Primate Origins and Evolution, A Phylogenetic Reconstruction.* Chapman and Hall, London.

Mayr, E.; Linsley, E. G. & Usinger, R. L. (1953). *Methods and Principles of Systematic Zoology.* McGraw-Hill Book Company Inc., New York.

Mays, S. (1998). *The Archaeology of Human Bones.* Routledge, London.

MacLaughlin, S. M.; Bruce, M. F. (1985): A Simple Univariate Technique for Determining Sex from Fragmentary Femora: Its Application to a Scottish Short Cist Population. *American Journal of Physical Anthropology* **67**: 413-417.

McGowan, C. (1999). *A Practical Guide to Vertebrate Mechanics.* Cambridge University Press, Cambridge.

McHenry, H. M. (1975). Fossils and the Mosaic Nature of Human Evolution. *Science* **190**: 425-431.

McMahon, T. A. & Bonner, J. T. (1986). *Tamaño y Vida.* Prensa Científica, Barcelona.

Meadows, L. & Jantz, R. L. (1995). Allometric Secular Change in the Long Bones from the 1800's to the Present. *Journal of Forensic Sciences* **40**(5): 762-767.

Mendes-Corrêa, A. A. (1919). Sur les Proportions des Membres chez le Foetus. *Revue Anthropologique* **7-8**: 219-224.

Mendes-Corrêa, A. A. (1923). Sur les Proportions des Membres chez les Portugais. *Comptes Rendus des Séances de L'Academie des Sciences [de Paris]* **176**: 709-711.

Mendonça, M. C. N. (1998). *Contribuicion para la Identificacion Humana a partir del Estudio de las Estructuras Óseas. Determinacion de la Talla a través de la Longitud de los Huesos Largos*. Tésis Doctoral. Facultad Medicina Universidad Complutense Madrid, Madrid.

Moore, W. L. (2000). Another Look at Neandertal Limb Proportions. *American Journal of Physical Anthropology* **30**: 231-232.

Neto, M. C. & Lopes, L. (s.d.). Aspectos Demográficos da Colecção Ferraz de Macedo. *Boletim da Sociedade de Geografia de Lisboa*. (em publicação).

Olivier, G. (1963). L'Estimation de la Stature par les Os Longs des Membres. *Bulletins et Mémoires de la Société de Anthroplogie de Paris* **4**(11): 433-449.

Olivier, G.; Aaron, C.; Fully, G. & Tissier, G. (1978). New Estimations of Stature and Cranial Capacity in Modern Man. *Journal of Human Evolution* **7**: 513-518.

Olivier, G. & Almeida, M. C. A. (1972). Forme du Crâne et Mortalité Différentielle par Tuberculose. *L'Anthropologie* **76**(5-6): 471-499.

Olivier, G. & Demoulin, F. (1990). *Pratique Anthropologique a l'usage des Étudiants*, I-*Osteologie*. Universté Paris, Paris

Olivier, G. & Tissier, H. (1975). Détermination de la Stature et la Capacité Cranianne. *Bulletins et Mémoires de la Société de Anthroplogie de Paris* **2**(8): 1-11.

Page, J. W. (1976). A Note on Interobserver Error in Multivariate Analysis of Populations. *American Journal of Physical Anthropology* **44**: 521-526.

Padez, C. (1998). Tendência Secular para o Aumento da Estatura na População Masculina Portuguesa (1904-1996). *Revista de Biologia*. **16**: 285-293.

Padez, C. & Johnston, F. (1999). Secular Trends in Male Adult Height 1904-1996 in Relation to Place of Residence and Parent's Educational Level in Portugal. *Annals of Human Biology* **26**(3): 287-298.

Parenti, R. (1971). Sulla Statura degli Uomini Cromagnoniani dei "Balzi Rossi" (Grimaldi). *Archivio per L'Antropologie e Etnologia* **101**: 37-62.

Pearson, K. (1897). Mathematical Contributions to the Theory of Evolution. On a Form of Spurious Correlation which may arise when Indices are used in the Measurement of Organs. *Proceedings of the Royal Society of London* **60**: 489-502.

Pearson, K. (1899). Mathematical Contributions to the Theory of Evolution. On the Reconstruction of the Stature of Prehistoric Races. *Philosophical Transactions of the Royal Society of London (Series A)* **192**: 169-244.

Pearson, K. & Bell, J. (1919). A Study of the Long Bones of the English Skeleton. Part I. The Femur. *Draper's Company Memoirs Biometric Series* **10**: 1-539.

Pearson, O. M. (2000). Postcranial Differences between Neandertals and Cold-Adapted Recent Humans. *American Journal of Physical Anthropology* **30**: 247.

Phillips, R. B. (1983). Shape Characters in Numerical Taxonomy and Problems With Ratios. *Taxon* **32**(4): 535-544.

Pineau, J. C.; Deloison, Y.; Ignazi, G. & Cabanis, E. A. (s.d.). Les Indices en Anthropologie. *Biométrie Humaine & Anthropologie* (em publicação).

Pons, J. (1955): The Sexual Diagnosis of Isolated Bones of the Skeleton. *Human Biology* **27**: 12-21.

Porter, A. M. W. (1999). Modern Human, Early Modern Human and Neanderthal Limb Proportions. *International Journal of Osteoarchaeology* **9**: 54-67.

Raubenheimer, D. (1995). Problems with Ratio Analysis in Nutritional Studies. *Functional Ecology* **9**: 21-29.

Reis, E. (1997). *Estatística Multivariada Aplicada.* Edições Sílabo, Lisboa.

Roberts, C. & Manchester, K. (1995). *The Archaeology of Disease.* Cornell University Press, New York.

Robinow, M. & Chumlea, W. C. (1982). Standards for Limb Bone Length Ratios in Children. *Radiology* **143**: 433-436.

Rocha, M. A. (1995). Les Collections Ostéologiques Humaines Identifiées du Musée Anthropologique de l'Université de Coimbra. *Antropologia Portuguesa* **13**: 7-38.

Rodrigues, T. (1997). *Cinco Séculos de Quotidiano. A Vida em Lisboa do Século XV aos Nossos Dias.* Edições Cosmos, Lisboa.

Rodman, P. S. & McHenry, H. M. (1980). Bioenergetics and the Origin of Homind Bipedalism. *American Journal of Physical Anthropology* **52**: 103-106.

Rogers, A. R. & Mukherjee, A. (1992). Quantitative Genetics of Sexual Dimorphism in Human Body Size. *Evolution* **46**(1): 226-234.

Ruff, C. B. (1993). Climatic Adaptation and Hominid Evolution: The Thermorregulatory Imperative. *Evolutionary Anthropology* **2**(2): 53-60.

Ruff, C. B. (1994). Morphological Adaptation to Climate in Modern and Fossil Hominids. *Yearbook of Physical Anthropology* **37**: 65-107.

Ruff, C. B. & Walker, A. (1991). Body Size of KNM-WT 15000. *American Journal of Physical Anthropology* **12**(Suppl.): 155.

Sandberg, L. G. & Steckel, R. H. (1987). Heights and Economic History: the Swedish Case. *Annals of Human Biology* **14**: 101-110.

Santos, A. L. C. (1995). *Certezas e Incertezas sobre a Idade à Morte*. Provas de Aptidão Pedagógica e Capacidade Científica. Trabalho de Síntese. Departamento de Antropologia, Faculdade de Ciências e Tecnologia da Universidade de Coimbra.

Saunders, S. R. (1989). Nonmetric Skeletal Variation. In: Iscan, M. Y. & Kennedy, K. A. R. (eds.). *Reconstruction of Life from the Skeleton*. Alan R. Liss, Inc., New York. Pp. 95-108.

Saunders, S. R.; Herring, D. A. & Boyce, G. (1995). Can Skeletal Samples Accurately Represent the Living Populations They Come From? The St. Thomas' Cemetery Site, Belleville, Ontario. In: Grauer, A. L. (ed.). *Bodies of Evidence. Reconstructing History through Skeletal Analysis*. John Wiley & Sons, New York. Pp. 69-89.

Scheaffer, R. L.; Mendenhall, W. & Ott, L. (1990). *Elementary Survey Sampling*. PWS-KENT Publishing Company, Boston.

Scheuer, J. L. & Bowman, J. E. (1995). Correlation of Documentary and Skeletal Evidence in the St. Bride's Crypt Population. In: Saunders, S. R. & Herring, A. (eds.). *Grave Reflections. Portraying the Past Through Cemetery Studies*. Canadian Scholar's Press Inc., Toronto. Pp. 49-66

Schreider, E. (1950). Geographical Distribution of the Body-Weight/Body-Surface Ratio. *Nature* **165**: 286.

Schreider, E. (1964). Ecological Rules, Body-Heat Regulation and Human Evolution. *Evolution* **18**(1): 1-9.

Schuessler, K. (1974). Analysis of Ratio Variables: Opportunities and Pitfalls. *American Journal of Sociology* **80**(2): 379-398.

Schultz, A. H. (1923). Fetal Growth in Man. *American Journal of Physical Anthropology* **6**: 389-399.

Schultz, A. H. (1930). The Skeleton of the Trunk and Limbs of Higher Primates. *Human Biology* **2**: 303-438.

Schultz, A. H. (1937). Proportions, Variability and Asymmetries of the Long Bones and Clavicles of Man and Apes. *Human Biology* **9**: 281-328.

Schutkowski, H. (1993). Sex Determination of Infant and Juvenile Skeletons: I. Morphognostic Features. *American Journal of Physical Anthropology* **90**: 199-205.

Schwidetzky, I. (1979). Contribution a l'Étude de la Variabilité Climatique chez l'Homme: Taille et Robustesse des Os Longs. *Bulletins et Mémoires de la Société de Anthroplogie de Paris* **6**: 343-347.

Sciulli, P. W.; Schneider, K. N. & Mahaney, M. C. (1990). Stature Estimation in Prehistoric Native Americans of Ohio. *American Journal of Physical Anthropology* **83**: 275-280.

Serra, J. A. & Lopes, A. Q. (1943). As Proporções e a Assimetria dos Membros nos Portugueses. *Contribuições para o Estudo da Antropologia Portuguesa* **4**(4): 231-312.

Shea, B. T. (1981). Relative Growth of the Limbs and Trunk of the African Apes. *American Journal of Physical Anthropology* **56**: 179-201.

Silva, A. M. (1995). Sex Assessment using the Calcaneus and Talus.. *Antropologia Portuguesa* **13**: 107-119.

Simpson, G. G.; Roe, A. & Lewontin, R. C. (1960). *Quantitative Zoology*. Harcourt, Brace and Company, New York.

Sjøvold, T. (1990). Estimation of Stature from Long Bones Utilising the Line of Otganic Correlation. *Human Evolution* **5**: 431-447.

Smith, R. J. (1999). Statistics of Sexual Size Dimorphism. *American Journal of Physical Anthropology* **36**: 423-459.

Sobral, F. (1990). Secular Changes in Stature in Southern Portugal between 1930 and 1980 According to Conscript Data. *Human Biology* **62**(4): 491-504.

Sokal, R. R. (1965). Statistical Methods in Systematics. *Biological Reviews of the Cambridge Philosophical Society* **40**: 337-391.

Sokal, R. R. & Braumann, C. A. (1980). Significance Tests for Coefficients of Variation and Variability Profiles. *Systematic Zoology* **29**: 50-66.

Sokal, R. R. & Rohlf, F. J. (1995*). Biometry. the Principles and Practice of Statistics in Biological Research*. W. H. Freeman and Company, New York.

St Hoyme, L. E. & Iscan, M. Y. (1989). Determination of Sex and Race: Accuracy and Assumptions. In: Iscan, M. Y. & Kennedy, K. A. R. (eds.). *Reconstruction of Life from the Skeleton*. Alan R. Liss, Inc., New York. Pp. 53-94.

StatSoft, Inc. (1996). STATISTICA for Windows (Computer program manual). Tulsa.

Steele, D. G. (1976). The Estimation of Sex on the Basis of the Talus and Calcaneus. *American Journal of Physical Anthropology* **45**: 581-588.

Stini, W. A. (1969). Nutritional Stress and Growth: Sex Difference in Adaptive Response. *American Journal of Physical Anthropology* **31**: 417-426.

Stini, W. A. (1971). Evolutionary Implications of Changing Nutricional Patterns in Human Populations. *American Anthropologist* **73**: 1019-1030.

Stini, W. A. (1985). Growth Rates and Sexual Dimorphism in Evolutionary Perspective. In: Gilbert, Jr. R. I. & Mielke, J. H. (eds.). *The Analysis of Prehistoric Diets*. Academic Press Inc., San Diego. Pp. 191-226.

Stringer, C. B. (1984). Human Evolution and Biological Adaptation in the Pleistocene. In: Foley, R. (ed.). *Hominid Evolution and Community Ecology, Prehistoric Human Adaptation in Biological Perspective*. Academic Press, London. Pp. 55-83

Stringer, C. B. (1989). Documenting the Origin of Modern Humans. In: Trinkaus, E. (ed.). *The Emergence of Modern Humans. Biocultural Adaptations in the Later Pleistocene*. Cambridge University Press, Cambridge. Pp. 67-96.

Stringer, C. B.; Hublin, J. J. & Vandermeersch, B. (1989). The Origin of Anatomically Modern Humans in Western Europe. In: Smith, F. H. & Spencer, F. (eds.). *The Origins of Modern Humans: A World Survey of the Fossil Evidence*. Alan R. Liss Inc., New York. Pp. 51-135.

Sundick, R. I. (1978). Human Skeletal Growth and Age Determination. *Homo* **29**: 228-249.

Susanne, C. (1984). Living Conditions and Secular Trend. *Studies in Human Ecology* **6**: 93-99.

Susman, R. L.; Stern J. T. & Jungers, W. L. (1985). Locomotor Adaptations in the Hadar Hominids. In: Delson, E. (ed.). *Ancestors. The Hard Evidence*. Alan R. Liss, Inc., New York. Pp. 184-192.

Taylor, J. V.; DiBennardo, R.(1982): Determination of Sex of White Femora by Discriminant Function Analysis: Forensic Sciences Applications. *Journal of Forensic Sciences* **27**(2): 417-423.

Telkkä, A. (1950). On the Prediction of Human Stature from the Long Bones. *Acta Anatomica* **9**: 103-117.

Themido, A. A. (1928). *Taille et Grande Envergure des Portugais*. Instituto de Antropologia de Coimbra, Coimbra.

Thieme, F. P. & Schull, W. J. (1957). Sex Determination from the Skeleton. *Human Biology* **29**: 242-273.

Tobias, P. V. (1991). On the Scientific, Medical, Dental and Educational Value of Collections of Human Skeletons. *International Journal of Anthropology* **6**(3): 277-280.

Trancho, G. J.; Robledo, B.; López-Bueis, I.; Sánchez, J. A. (1997): Sexual Determination of the Femur Using Discriminant Functions. Analysis of a Spanish Population of Known Sex and Age. *Journal of Forensic Sciences* **42**(2): 181-185.

Trinkaus, E. (1981). Neanderthal Limb Proportions and Cold Adaptation. In: Stringer, C. B. (ed.). *Aspects of Human Evolution.* Taylor and Francis Ltd, London. Pp. 187-224.

Trinkaus, E. (1986). The Neanderthals and Modern Human Origins. *Annual Review of Anthropology* **15**: 193-218.

Trinkaus, E. (1989a). The Upper Pleistocene Transition. In: Trinkaus, E. (ed.). *The Emergence of Modern Humans. Biocultural Adaptations in the Later Pleistocene.* Cambridge University Press, Cambridge. Pp. 42-66.

Trinkaus, E. (1989b). Neandertal Upper Limb Morphology and Manipulation. In: Giacobini, G. (ed.). *Hominidae. Proceedings of the 2nd International Congress of Human Paleontology.* Jaca Book, Milano. Pp. 331-338.

Trinkaus, E.; Zilhão, J. & Duarte, C. (1999). The Lapedo Child: Lagar Velho 1 and Our Perceptions of the Neandertals. *Mediterranean Prehistory Online* http://www.med.abaco-mac.it/articles/doc/013.htm.

Trotter, M. & Gleser, G. (1951). The Effect of Ageing on Stature. *American Journal of Physical Anthropology* **9**: 311-324.

Trotter, M. & Gleser, G. (1952). Estimation of Stature from Long Bones of American Whites and Negroes. *American Journal of Physical Anthropology* **10**: 463-514.

Trotter, M. & Gleser, G. (1958). A Re-Evaluation of Estimation of Stature Based on Measurements of Stature Taken During Life and of Long Bones after Death. *American Journal of Physical Anthropology* **16**: 79-123..

Trotter, M. & Gleser, G. (1977). Corrigenda to "Estimation of Stature from Long Bones of American Whites and Negroes" American Journal of Physical Anthropology (1952). *American Journal of Physical Anthropology* **47**: 355-356.

Ubelaker, D. (1989). *Human Skeletal Remains.* Taraxacum, Washington.

Uternohle, C. J. & Zegura, S. L. (1982). Intra- and Interobserver Error in Craniometry: A Cautionary Tale. *American Journal of Physical Anthropology* **57**: 303-310.

Uttermohle, C. J.; Zegura, S. L. & Heathcote, G. M. (1983). Multiple Observers, Humidity and Choice of Precision Statistics: Factors Influencing Craniometric Data Quality. *American Journal of Physical Anthropology* **61**: 85-95.

van Gerven, D. P. (1972). The Contribution of Size and Shape Variation to Patterns of Sexual Dimorphism of the Human Femur. *American Journal of Physical Anthropology* **37**: 49-60.

van Vark, G. N. (1987). An Anthropometric Approach to the Study of Evolution. *Acta Morphologica Neerlando-Scandinavica* **25**: 107-116.

van Vark, G. N. & Van der Sman, P. G. M. (1982). New Discrimination and Classification Techniques in Anthropological Practice. *Zeitschrift fur Morphologie und Anthropologie* **73**: 21-36.

Vicente, P.; Reis, E. & Ferrão, F. (1996). *Sondagens, a Amostragem como Factor Decisivo de Qualidade*. Edições Sílabo, Lisboa.

Walker Jr., W. F. & Liem, K. F. (1994). *Functional Anatomy of the Vertebrates. An Evolutionary Perspective*. Saunders College Publishers, Fort Worth.

Walker, P. L.; Johnson, J. R. & Lambert, P. M. (1988). Age and Sex Biases in the Preservation of Human Skeletal Remains. *American Journal of Physical Anthropology* **76**: 183-188.

Wallis, R. S. (1931). Relative Growth of the Extremities from Two to Eighteen Years of Age. *American Journal of Physical Anthropology* **16**: 171-191.

Wasterlain, S. N.; Cardoso, H. & Cunha, E. (2000). *Sex Determination of Portuguese Femur and Humerus by Discriminant Functions*. Póster apresentado no 69th Annual Meeting of the American Association of Physical Anthropologists.

Weaver, D. S. (1980). Sex Differences in the Ilia of a Known Sex and Age Sample of Fetal and Infant Skeletons. *American Journal of Physical Anthropology* **52**: 191-195.

Weiss, K. M. (1972). On the Systematic Bias in Skeletal Sexing. *American Journal of Physical Anthropology* **37**: 239-250.

Wheeler, P. E. (1993). The Influence of Stature and Body Form on the Hominid Energy and Water Budgets; a Comparison of Australopithecus and Early Homo Physiques. *Journal of Human Evolution* **24**: 13-28.

Witte, H.; Preuschoft, H. & Recknagel, S. (1991). Human Body Proportions Explained on the Basis of Biomechanical Principles. *Zeitschrift fur Morphologie und Anthropologie* **78**: 407-423.

Wolfe, L. D. & Gray, J. P. (1982). Subsistence Practices and Human Sexual Dimorphism of Stature. *Journal of Human Evolution* **11**: 575-580.

Wolpoff, M. H. (1983). Lucy's Lower Limbs: Long enough for Lucy to be Fully Bipedal. *Nature* **304**: 59-61.

Wolpoff, M. H. (1989). The Place of the Neandertals in Human Evolution. In: Trinkaus, E. (ed.). *The Emergence of Modern Humans. Biocultural Adaptations in the Later Pleistocene.* Cambridge University Press, Cambridge. Pp. 97-141.

Wu, L. (1989): Sex Determination of Chinese Femur by Discriminant Function. *Journal of Forensic Sciences* **34**(5): 1222-1227.

Y'Edynak, G. (1976). Long Bone Growth in Western Eskimo and Aleut Skeletons. *American Journal of Physical Anthropology* **45**: 569-574.

Yezerinac, S. M.; Lougheed, S. C. & Handford, P. (1992). Measurement Error and Morphometric Studies: Statistical Power and Observer Experience. *Systematic Biology* **41**(4): 471-482.

Zar, J. H. (1999). *Biostatistical Analysis.* Prentice Hall International, Inc., London.