8. BIBLIOGRAFIA

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VAN AARSEN B.G.K, COX H.C., HOOGENDOORN P. i DE LEEUW J.W. (1990) A cadinene biopolymer in fòssil and extant dammar resins as a source for cadinenes and bicadinenes in crude oils from South East Àsia. *Geochim. Cosmochim. Acta* **54**, 3021-3031.

VAN AARSEN B.G.K, HESSELS J. K. C, ABBINK O. A. i DE LEEUW J.W. (1992) The occurrence of polycyclic sesqui-, tri-, and oligoterpenoids derived from a resinous polymeric cadinene in crude oils from South East Àsia. *Geochim. Cosmochim. Acta* **56**,1231-1246.

ADAM P. (1991) *Nouvelles structures organo-soufrées d'intérèt géochimique: Aspects moléculaires et macromoleculaires.* Tesi Doctoral. Univ. Louis Pasteur, Strasbourg.

ALBAIGÉS J., ALGABA J., CLAVELL E. i GRIMALT J. (1986) Petroleum geochemistry of the Tarragona Basin (Spanish Mediterranean off-shore). A *Adv. Org. Geochem.* 1985 (eds. Leythaeuser D. and Rullkòter J.). *Org. Geochem.* 10, 441-450.

ALEXANDER R., HAZAI I. i MINK G. (1990) The isomerizations and aromatization of 16α(H)-phyllocladane in sedimentary environments. *Naturwissenschaften* **77,** 534-536.

ALEXANDER R., KAGI R., NOBLE R. i VOLKMAN J.K. (1984) Identification of some bicyclic alkanes in petroleum. *AAdv. Org. Geochem.* 1983 (eds. Schenck P.A. de Leeuw J. W. and Lijmbach G. W. M.) Pergamon Press, Oxford. *Org. Geochem.* **6**, 63-70.

ALEXANDER G., HAZAI I., GRIMALT J. i ALBAIGÉS J. (1987) Occurrence and transformation of phyllocladanes in brown coals from Nograd Basin, Hungary. *Geochim. Cosmochim. Acta* **51**,2065-2073.

ANADÓN P., CABRERA L., COLOMBO F., MARZO M. i RIBA O. (1986) Syntectonic intradeformational unconformities in alluvial fan deposits, eastern Ebro basin margins (NE Spain). A *Foreland basins* (Alien Ph. i Homewood P.), Spec. Pub. Int. Ass. Sedim. **8**,259-271.

ANADÓN P., VIANEY-LIAUD M., CABRERA L. i HARTENBERGER J. L. (1987) Gisements à vertebrés du Paléogène de la zone orientale du basin de l'Ebre et leur apport a la stratigraphie. *Paleont. Evol.* **21**,117-131.

ANADÓN P., CABRERA L., COLLDEFORNS B. i SÀEZ A. (1989) Los sistemas lacustres del Eoceno superior y Oligoceno del sector oriental de la Cuenca del Ebro. *Acta Geolog. Hisp.* **24**,205-230.

ANADÓN P., CABRERA L., CHOI S. J., COLOMBO F., FEIST M. i SÀEZ A. (1992) Biozonación del Paleógeno continental de la zona oriental de la cuenca del Ebro mediante carófitas: implicaciones en la biozonación general de carófitas de Europa occidental. *Acta Geol. Hisp.* **27**, 69-94.

BLANC Ph. i **ALBRECHT,** P. (1990) Molecular markers in bitumen and macromolecular matrix of coals. Their evaluation as rank parameters. A *Coal Science and Technology* **15**. Elsevier.

BLUMER M. (1965) Orgànic pigments: their long-term fate. *Science* **149,** 722-726.

BRASSELL S. C, EGLINTON G. i MO J. F. (1986) Biological marker compounds as indicators of the depositional history of the Maoming oil skate. A *Adv. Org. Geochem.* 1985 (eds. Leythaeuser i Rullkotter J.), *Org. Geochem.* **10**, 927-941.

BRASSELL S.C., WARDROPER A.M.K., THOMSON I., MAXWELL J.R. i EGLINTON G. (1981) Specific acyclic isoprenoides as biological markers of methanogenic bacterià in marine sediments. *Nature* **290,** 693.

BUDZINSKI H., GARRIGUES P., CONNAN J. i BELLOCQ J. (1990) Identification alkylated dibenzothiophenes: Application to orgànic geochemistry.

CABRERA L. (1983) *Estratigrafia y sedimentologia de las formaciones lacustres del Transito Oligoceno-Mioceno del SE de la Cuenca del Ebro.* Tesi doctoral. Univ. de Barcelona.

CABRERA L. i GAUDANT J. (1986) Ciprínidos (pisces) del sistema lacustre oligocénico-miocénico de los Monegros (sector SE de la Cuenca del Ebro, provincias de Lleida, Tarragona, Huesca y Zaragoza. *Acta Geol. Hispànica* **20,**219-226.

CABRERA L. i SÀEZ A. (1987) Coal deposition in carbonate-rich shallow lacustrine systems: the Cala and Mequinenza sequences (Oligocene, eastern Ebro Basin, NE Spain). *Jour. geol. Soc. London* **144,**451-461.

CABRERA L., COLOMBO F. i ROBLES S. (1985) Sedimentation and tectonics interrelationships in the Paleogene marginal alluvial systems of the SE Ebro Basin. Transition from alluvial to shallow lacustrine environments. A *Excursion Guide Book of the óTh European Regional IAS meeting.* (eds. Milà M. i Rosell J.). Excursion **10,** 393-492, Lleida.

CABRERA M.i GORCHS R. i DE LAS HERAS F. X. (1998) Unsaturated biomarkers as a new diagenetic clues in sulphur-rich sedimentary rocks (enviat).

CAPLE M. B., HSI-CHAO CHOW i STROUSE C. E. (1978) Photosyntetic pigments of green sulphur bacterià. The esterifying alcohols of bacteriochlorophylls c from *Chlorobium Limicola. J. Biol. Chem.* **253,** 6730-6737.

CARDOSO J., MAXWELL J. R., GODFELLOW R., EGLINTON G. i GLONBIC S. (1978) A biogeochemical of the Abu Dhabi algal mats: A simplified ecosystem. *Chem. Geol.* **23**, 65.

CASAGRANDE D. J. (1987) Sulphur in peat and coal. A *Codi and Coal-bearing Strata: Recent Advances.* (ed. Scott A. C.) **32**, 87-105. Geol. Soc. London Spec. Publ.

CASSANI F., GALLANGO O., TALUKDAR S., VALLEJOS C. i EHRMANN U. (1987) Methylphenanthrene maturity index of marine source rock extracts and crude oils from the Maracaibo Basin. A *Adv. Org. Geochem.* 1987 (eds. Mattanelli L. i Novelli L), *Org. Geochem.* **13**, 73-80.

CHAFFEE A. L. i JOHNS R. B. (1983) Polyciclic aromàtic hydrocarbons in Australian coals. Angularly fused tri- and tetra- aromàtic components of Victorian brown coal. *Geochim. Cosmochim. Acta* **47**, 2141-2155.

CHAKHMAKHCHEV A. i SUZUKI N. (1995) Saturate biomarkers and aromàtic sulfur compounds in oils and condensates from different source lithologies of Kazakhstan, Japan and Rússia. *Org. Geochem.* **23**,289-299.

CHOU C. L. (1990) Geochemistry of sulfur in Fòssil Fuels. *AAm. Chem. Soc.* (eds. Orr W. L. i White C. M.) ACS Symposium series **249,** 31-47. Whasington D. C.

CLOSAS i MIRALLES J. (1948) Los carbones minerales de Catalunya. *Miscelànea VII Almera II.* 61-193. Instituto Geológico. Barcelona.

COLOMBO F (1986) Estratigrafia y sedimentologia del Paleógeno continental del borde meridional occidental de los Catalanides (Provincia de Tarragona, Espana). *Cuad. Geol. Ibérica* **10,55-115.**

COLOMBO (1980) *Estratigrafia y sedimentologia del terciario inferior continental de los Catalanides.* Tesi doctoral. Univ. de Barcelona.

COLOMBO F., CUEVAS J. L. i MERCADÉ L. (1986) Las facies Garumnienses del fiançó sur del sinclinal de Àger. Anàlisis sedimentológico. Collected Abstr. A *Com. llth Congr. Espanol de Sedimentology, Barcelona.* 50.

CONNAN J., BOUROULLEC J., DESSORT D. i ALBRECHT P. (1986) The microbial input in carbonate-anhydrite facies of a sabkha paleoenvironment from Guatemala: A molècula approach. A *Adv. Org. Geochem.* 1985 (eds. Leythaeuser D. i Rullkòtter J.). *Org. Geochem.* **10**, 29-50.

CONNER A. H., NAGASAMPAGI B. A. i RAWE J. W. (1980) Terpenoid and other extractives of western white pine bork. *Phytochemistry* **19,** 1121-1131.

CYR T. D., PAYZANT J. D., MONTGOMERY D. S i STRAUSZ O. P. (1985) A homologous series of novel hopane sulfides in petroleum. *Org. Geochem.* **9**,139-143.

CZECHOWSKI F. (1995) Biomarkers assemblage in relation to coal rank. A *Coal Science* (eds. Pajares J. A. i Tascón J. M. D.) 291-294, Elsevier; Amsterdam.

DASTILLUNG M., ALBRECHT P. i OURRISSON G. (1980) Aliphatic and policyclic alcohols in sediments. Hydroxylated derivatives of hopane and 3-methylhopane. *J. Chem. Res.* 5:168; M2353-2374.

DEPAPE G. i BRICE D. (1965) La flore oligocène de Cervera (Catalogne). *Ann. Soc. Géol. Nord.* **85**, 111-118.

DONG J.-Z., VORKINK W.P. i LEE M.L. (1993) Origin of long-chin alkylcyclohexanes and alkylbenzenes in a coal-bed wax. *Geochim. Cosmochim. Acta* **57**, 837-849.

DOUGLAS A. G., SINNINGHE DAMSTÉ J. S., FOWLER M. G., EGLINTON T. I. i DE LEEUW J. W. (1991) Unique distributions of hydrocarbons and sulphur compounds released by flash pyrolysis from the fossilized alga Gloeocapsomorpha prisca, a major constituent in one of four Ordovician kerogens. *Geochim. Cosmochim. Acta* **55***,215-291.*

ELLIS L., SINGH R. K., ALEXANDER R. i KAGI R. I. (1996) Formation of isohexyl alkylaromatic hydrocarbons from aromatization-rearrangement of terpenoids in the sedimentary environment: A new class of biomarkers. *Geochim. Cosmochim. Acta* **60**,4747-4763.

ENGEL M. H. i MACKO S. A. (1993) *ORGÀNIC GEOCHEMISTRY. Principies and Applications.* Plenum Press, Nova York i Londres.

EVANS R. i KIRKLAND D. W. (1988) *Evaporitic environments as a source of petroleum in evaporites and hydrocarbons* (ed. Schreiber B. Ch.), 256-299. Colúmbia University Press.

FAN PU, PHILP R. P., LI ZHENXI i YING GUANGGUA (1990) Geochemical characteristics of aromàtic hydrocarbons of crude oils and source rocks from different sedimentary environments. A *Adv. Org. Geochem.* 1989 (eds. Durand B. i Behar F.) Pergamon Press, Oxford. *Org. Geochem.* **16**,427-435.

FERNÀNDEZ MARRÓN M. T. (1971J *Estudio paleoecológico y revisión sistemàtica de la flora fósil del Oligoceno español.* Tesi doctoral. Publ. Fac. Ciencias Univ. Complutense de Madrid (A) **152,**1-177.

FOWLER M. G., ABOLINS P. i DOUGLAS A. G. (1986) Monocyclic alkanes in Ordovician orgànic matter. A *Adv. Org. Geochem.* 1985 (eds. Leytheauser D. i Rullkotter J.). *Org. Geochem.* **10**, 815-823.

GARCIA-VALLÈS M., PRADO J. i VENDRELL-SAZ (1994) Maceral distribution in Garumnian coals and palaeoenvironmental implications in the central Pyrenees, Spain. *Int. J. Coal Geol.* **25**, 27-46.

GARRIGUES P., DE SURY R., ANGELIN M. L., BELLOCQ J., ANDIN J. L. i EWALD M. (1988) Relation of the methylated aromatic hydrocarbon distribution pattern to the maturity of organic matter in ancient sediments from the Mahakam delta. *Geochim. Cosmochim. Acta* **52**, 375-384.

GISBERT J. (1986) Els temps tardihercinians als Països Catalans. *Història Natural dels Països Catalans* (Geologia I), 202-240. Enciclopedia Catalana.

GORCHS R., DE LAS HERAS F.X., GRIMALT J., SAEZ A. i CABRERA L. (1993) Hydrocarbon biomarkers in the sulphur-rich Mequinensa coals. *Org. Geochem. Stavanger* (eds. 0ygard K.), 461-465.

GORCHS R., CATALAN C, DANISHFAR P., CABRERA L. i DE LAS HERAS F.X. (1995) Origin and fate of sulphur in Spanish coals. *Coal Science* (eds. Pajares J. A. i Tascón B. V.) Coal Science and Technology **24**,1657-1660. Elsevier, Oviedo.

DE GRAAF W., SINNINGHE DAMSTÉ J. S. i DE LEEUW J. W. (1992) Laboratory simulation of natural sulphurization I. Formation of monomeric and oligomeric isoprenoid polysulphides by low-temperature reactions of inorganic polisulphides with phytol and phytadienes. *Geochim. Cosmochim. Acta* **56**, 4321-4328.

GREINER A. CH., SPYCKERELLE C, ALBRECHT P. i OURISSON G. (1977) Aromatic hydrocarbons from geological sources. Part V. Mono- and di- aromatic hopanes derivatives. *J. Chem. Res.* 5:334, *M,* 3829-3871.

GRIMALT J. O., GRIFOLL M., SOLANAS A. M. i ALBAIGÉS J. (1991) Microbial degradation of marine evaporitic crude oils. *Geochim. Cosmochim. Acta* **55**, 1903-1913.

GRIMALT J., ALEXANDER G., HAZAI I. i MINK G. (1990). The isomerization and aromatization of 16α(H)-phyllocladane in sedimentary environments. *Naturwissenschaften* **77**, 534-536.

GRIMALT J. O., SIMONEIT B. R. T., HATCHER P. G. i NISSENBAUM A. (1988) The molecular composition of ambers. *13th International Meeting on Organic Geochemistry* (Europ. Assoc. Org. Geochem.), 313-314. Venècia.

GUIMERÀ J. (1984) Paleogene evolution of deformation in the northeastern Iberian Peninsula. *Geological Magazine* **121,**413-420.

HAENEL M. W. (1992) Recent progress in coal structure research. *Fuel* **71**, 1211-1223.

HARTGERS W. A. (1994,) *Aromatic moieties in Geomacromolecules: Structure, Origin and Significance.* Tesi Doctoral. Univ. Tèc. de Delft.

HARTGERS W. A., SINNINGHE DAMSTÉ J. S., REQUEJO A. G., ALLAN J., HAYES J. M., LING Y., XIE T.M., PRIMACK J. i DE LEEUW J. W. (1994) A molecular and carbon isotopic study towards the origin and diagenetic fate of diaromatic carotenoids. A *Adv. Org. Geochem.* 1993 (eds. Telnaes N., van Graas G. i ∅ygard K.). *Org. Geochem.* **22,** 703-725.

TEN HAVEN H. L. (1986) *Organic and inorganic geochemical aspects of Mediterranean late quaternary sapropels and Messinian evaporitic deposits.* Tesi Doctoral, Univ. Tèc. de Delft.

TEN HAVEN H. L., DE LEEUW J. W. i SCHENCK P. A. (1985) Organic geochemical studies of a Messinian evaporitic basin, Northern Apenines (Italy) I: hydrocarbon biological markers for a hypersaline environment. *Geochim. Cosmochim. Acta* **49**,2181-2191.

HAZAI I., ALEXANDER G. i SZEKELY T. (1986) Investigation of hydrocarbon constituents of a young sub-bituminous coal by gas chromatography-mass spectrometry. *J. Chromatogr.* **367**, 117-133.

DE LAS HERAS F. X. (1991,) *Geoquímica orgánica de conques lacustres fòssils.* Institut d'Estudis Catalans. Arxius de la secció de Ciències, XCVII.

DE LAS HERAS F. X., GRIMALT J. O. i ALBAIGÉS J. (1991) Novel C-ring cleaved triterpenoid-derived aromatic hydrocarbons in Tertiary brown coals. *Geochim. Cosmochim. Acta* **55**, 3379-3385.

DE LAS HERAS F. X., GRIMALT J., CABRERA L. i SÀEZ A. (1990) Organic matter in lacustrine coal deposits (Calaf i Mequinenza sequences, Eastern Ebro Basin, NE Spain). *13 rd International European sedimentological Congress.* Nottingham.

Historia Natural dels Països Catalans (1986, 1992) **(Geologia I i II).** Enciclopedia Catalana.

HOFMANN P., FOSTER C. B., POWELL T. G. i SUMMONS R. E. (1987) Hydrocarbons biomarkers from Ordovician sediments and the fossil alga *Gloeocapsamorphaprisca* Zalessky 1917. *Geochim. Cosmochim. Acta* **51**, 2681-2697.

HOLZER G. (1983) Lipids from methane producing and suphate reducing bateria.

HUSSLER, G., CONNAN, J. i ALBRECHT, P. (1984) Novel families of tetra-and hexacyclic aromatic hopanoids predominant in carbonate rocks and crude oils. *Org. Geochem.* **6**, 39-49.

IGME (1975) *Estudio geológico-minero del área lignitífera y uranífera de Calaf.* Inèdit.

IGME (1985) *Prospección previa de lignitos en el área de Pinós-Molsosa (Lérida-barcelona.* Inèdit.

INHOFF J. F. i TRÜPER H. G. (1980) Cromatium purpuratum sp. Nov., A new species of *chromatiaceae. IlZbl. Bakt. I. Abt. Orig. Ch.* **1,**61-69.

INHOFF J. F. i TRÜPER H. G. (1976) Marine sponges as habitats of anaerobic photosynthetic bacteria. *Microbiol. Ecol.* **3,**1-9.

KADOTA H. i ISHIDA Y. (1972) Production of volatile sulphur compounds by microorganisms. *Ann. Rev. Microbio!.* **26**, 127-138.

KEELY B., SINNINGHE DAMSTÉ J., BETTS S. E., LING YUE, DE LEEUW J. W. i MAXWELL J. R. (1993) A molecular stratigraphic approach to palaeoenvironmental assessment and the recognition of changes in source inputs in marls of the Mulhouse Basin (Alsace, France). *Org. Geochem.* **20**, 1165-1186.

KILLOPS S. D. i KILLOPS V. J. (1993) *An introduction to Organic Geochemistry,* 265. Longman, Harlow.

KOHNEN M. E. L., SINNINGHE DAMSTÉ J. S., TEN HAVEN H. L i DE LEEUW J. W. (1989) Early incorporation of poly sulphides in sedimentary organic matter. *Nature* **341,** 640-641.

KOHNEN M. E. L., SINNINGHE DAMSTÉ J. S., KOCK-VAN DALEN A. C, TEN HAVEN H. L., RULLKOTER J. i DE LEEUW J. W. (1990) Origin and diagenetic transformations of C_{25} and C_{30} highly branched isoprenoid sulphur compounds: further evidence for the formation of organically-bound sulphur during very early diagenesis. *Geochim. Cosmochim. Acta* **54**, 3053-3063.

KOHNEN M. E. L., SCHOUTEN S., SINNINGHE DAMSTÉ J. S., DE LEEUW J. W., MERRIT D. A. i HAYES J. M. (1992) Recognition of paleobiochemicals by a combined molecular sulfur and isotope geochemical approach. *Science* **256,** 358-362.

KOHNEN M. E. L., SINNINGHE DAMSTÉ J. S., BAAS M., KOCK-VAN DALEN A. C. i DE LEEUW J. W. (1993) Sulphur-bound steroid and phytane carbon skeletons in geomacromolecules: Implications for the mechanism of incorporation of sulphur into organic matter. *Geochim. Cosmochim. Acta* **57**, 2515-2528.

KOOPMANS M.P., SINNINGHE DAMSTÉ J.S., LEWAN M.D. i DE LEUW J.W. (1993) Maturity-related changes in abundance and distributions of hydrocarbons, organic sulphur compounds and sulphur-rich geomacromolecules as revealed by hydrous pyrolysis of a Miocene sediment. *Organic Geochemistry Meeting Stavanger 1993 (ed. 0ygardK.), 125-128.*

LAFLAMME R. E. i HITES R. A. (1978) The global distribution of polycyclic aromatic hydrocarbons in recents sediments. *Geochim. Cosmochim. Acta* **42**,289-303.

LAFLAMME R. E. **i HITES R. A.** (1979) Tetra- and pentacyclic, naturally-occuring, aromatic hydrocarbons in recent sediments. *Geochim. Cosmochim. Acta* **43**, 1687-1691.

LANGWORTYHY T. A., TORNABENE T.G. i HOLZER G. (1982) Lipids of Archaebacteria. *Zbl. Bakt. Hyg, I. Abt. Orig.* C37,228-244.

LEE M. L., VASSILAROS D. L., WHITE C. M. i NOVOTNY M. (1979) Retention indices for programmed-temperature capillary-column gas chromatograply of polycyclic aromatic hydrocarbons. *Anal. Chem.* **51**,768-773.

DE LEEUW J. W. i SINNINGHE DAMSTÉ J. S. (1990) In Geochemistry of sulfur in fossil fuels. *Am. Chem. Soc.* (eds. Orr W. L. and White C. M.), 417-443. Washington.

DE LEEUW J.W., SINNINGHE DAMSTÉ J.S., KLOK J., SCHENCK P.A. i BOON J.J. (1985) Biochemistry of Gavish Sabkha sediments I. Studies on neutral reducing sugars and lipids moities by gas chromatography-mass spectrometry. A *Ecological Studies* **53**, *Hypersaline ecosystems* (eds. Friedman G. M. i Krumbein W. E.), 350-367. Springer-Verlag, Berlin.

LIAAEN-JENSEN S. (1978) Marine carotenoids. A *Marine Natural Products* (eds. Faulkner D. J. i Fenicall W. H.), 1-73, Academic Press, Londres.

MACKENZIE A. (1984) Applications of biological markers in petroleum geochemistry. A *Adv. Petro. Geochem.* (eds. Brooks J. i Welte D.), **1**, 115-214. Academic Press, Londres.

MACKENZIE A. i MCKENZIE D. (1983) Isomerization and aromatisation of hydrocarbons in sedimentary basins formed by extension. *Geol. Mag.* **120,** 417-528.

MACKENZIE A., HOFFMAN C. i MAXWELL J. (1981) Molecular parameters of maturation in the toarcian shales, Paris Basin, France III. Changes in aromatic steroid hydrocarbons. *Geochim. Cosmochim. Acta* **45**,1345-1355.

MARTIN M. (1974) Sobre la petrogénesis de algunas litofacies españolas con fases urano-orgánicas. *Bol. Geol. Minero* **85**, 561-581.

MARTIN J. D. i DARÍAS J. (1978) Algal sesquiterpenoids. A *Marine Natural Products, Chemical and Biological Perspectives* (ed. Scheuer P. J.) **I**, 125-173. Academic Press, Nova York.

McEVOY J. i GIGER W. (1986) Origin of hydrocarbons in Triassic Serpiano oil shales: Hopanoids. A *Adv. Org. Geochem.* 1985. *Org. Geochem.* **10,** 943-949.

MEYERS P. A. i ISHIWATARI R. (1993) The early diagenesis of organic mattter in lacustrine sediments. *Org. Geochem. Principles and Applications* (eds. Engel M. H. i Macko S. A.) Plenum Press, Nova York i Londres.

MOLDO WAN J. M. i SEIFERT W. K. (1979) Head-to-head linked isoprenoid hydrocarbons in petroleum. *Science* **204,**169-171.

MOLDOWAN J. M. i FAGO (1986) Structure and significance of a novel rearranged monoaromatic steroid hydrocarbon in petroleum. *Geochim. Cosmochim. Acta* **50,** 343-351.

MOLDOWAN J. M., SEIFERT W. K. i GALLEGOS E. J. (1985) Relationship between petroleum composition and depositional environment of petroleum source rocks. *American Association of Petroleum Geologists Bulletin* **69**, 1255-1268.

MOLDOWAN J. M., SUNDARARAMON P. i SCHOELL M. (1986) Sensitivity of biomarker properties to depositional environment and/or source input in the Lower Toarcian of S. W. Germany. *Org. Geochem.* **10**, 915-926.

MOLDOWAN J. M., LEE C. Y. WAITT D. S., JEGANATHAN A., SLOGUI N. E. i GALLEGOS E. **J.** (1991) Analysis and occurrence of C_{26}-steranes in petroleum and source rocks. *Geochim. Cosmochim. Acta* **55**,1065-1081.

MOSSMANN J.R., APLIN A. C, CURTIS CH. D. i COLEMAN M. L. (1991) Geochemsitry of inorganic and organic sulphur in organic-rich sediments from the Peru Margin. *Geochim. Cosmochim. Acta* **55**, 3581-3595.

NOBLE R., KNOX J., ALEXANDER R. i KAGI R. (1985) Identification of Tetracyclic Diterpene Hydrocarbons in Australian Crude Oils and Sediments. *J. Chem. Soc. Chem. Commun.,* 32-33.

NOBLE R. A., ALEXANDER R., KAGI R. Y. i KNOX J. (1986) Identification of some diterpenoid hydrocarbons in petroleum. A *Adv. Org. Geochem.* 1985 (eds. Leythaeuser D. i Rullkòtter). *Org.Geochem.* **10**, 825-829.

OTTO A., WALTHER H. i PÜTTMANN W. (1997) Sesqui- and diterpenoid biomarkers preservedd in taxodium-rich Oligocene oxbow lake clays, Weisselster basin, Germany. *Org. Geochem.* **26**, 105-115.

OURISSON G., ALBRECHT P. i ROHMER M. (1979) The paleochemistry and biochemistry of a group of natural products. *Pure Appl. Chem.* **51**,709-729.

OBERHÀNSLI H. i ALLEN Ph. A. (1987) Stable isotopic signatures of Tertiary lake carbonates, Eastern Ebro Basin, Spain. *Palaeogeogr., Palaeoclimatol, Plaeoecol.* **60**, 59-75.

OVERMANN J., GYPIONKA H. i PFENNING N. (1992) An extremely low-light-adapted phototrophic sulfur bacterium from the Black Sea. *Limnol. Oceanogr.* **37,** 150-155.

PARKES R.J., CRAGG B.A., GETLIFF J.M., HARVEY S.M., FRY J.C., LEWIS CA. i ROWLAND S.J. (1993) A quantitative styde of microbial decomposition of biopolymers in recent sediments from the Peru Margin. *Marine Geol.* **113,** 55-56.

PARRISH J. T., ZIEGLER A. M. i SCOTESE C. R. (1982) Rainfall patterns and the distribution of coals and evaporites in the Mesozoic and Cenozoic. *Paleogeogr., Paleoclimatol, Paleoecol.* **40**, 67-101.

PEAKMAN T.M., SINNINGHE DAMSTÉ J.S. i DE LEUW J.W. (1989) The identification and geochemical significance of a series of alkylthiophenes comprising a linearly extended phytane skeleton in sediments and oils. *Geochim. Cosmochim. Acta* **53**, 3317-3322.

PERAKIS N. (1986) *Separation et detection selective de composés soufrés dans les fraccions lourdes despetroles. Geochimie des benzo[b]thiophénes.* Tesi Doctoral, Univ. Louis Pasteur.

PETERS K. E. i MOLDOWAN J. M. (1993) *The Biomarker Guide.* Interpreting Molecular Fossils in Petroleum and Ancient Sediments. Pretince Hall, Englewood Cliffs.

PETERS K. E., MOLDOWAN J. M., DRISCOLE J. M. i DEMAISON G. J. (1989) Origin of Beatrice oil by co-souring from Devonian and Middle Jurassic source rocks, Inner Moray Firth, U. K. *Amer. Assoc. Petrol. Geol. Bulletin* **73**,454-471.

PETERSON J. (1988) Dolomitization in thin bedded calcarenites of the Oligocene Los Monegros Group (Oligocene). Southeastern Ebro Basin, Spain. *Cavalcade of carbonates. AAPG/SEPM Annu. Meet.* (ed. Cooper J. D.) SEPM Field trip. **3**, 135-144.

PETERSON J. i CABRERA L. (1989) Dolomitization in thin bedded calcarenites of the Oligocene Los Monegros Group, SE Ebro Basin, Spain. A *Cavalcade of carbonates AAPG/SEPM Annual Meet* (ed. Cooper J. D.), **3**,135-144. SEPM Fiels Trip.

PHENNING N. (1989) Ecology of phototrophic purple and green sulphur bacteria. A *Biology of Autotrophic Bacteria* (eds. Schlegel H. i Barwien B.) **97**. Science Tech. Publisher.

PHILP R. P. (1985) *Fossil fuel biomarkers.* Aplications and Spectra. Elsevier, Amsterdam.

DE PORTA J., KEDVES M., SOLÉ N. i CIVÍS J. (1985) Palinologia del Maastrichtiense del Barranco de la Posa (Lérida, España). Problemàtica regional. *Rev. Int. Geol.* **40**, 5-28.

PUIGDEFÀBREGAS C, MUÑOZ J. A. i MARZO M. (1986) Thrust belt development in the Eastern Pyrenees and related depositional sequences in the foreland basin. A *Foreland basins Spec. Publ. Int. Ass. Sedim.* (eds. Allen Ph. i Homewood P.), **8**, 319-336.

PÜTTMANN W. i VILLAR H. (1987) Occurrence and geochemical significance of 1,2,5,6-tetramethylnaphtalene. *Geochim. Cosmochim. Acta* **51**, 3023-3029.

QUEROL X. (1990) *Distribución de azufre i materia mineral en los carbones de la Fm. Escucha. Relaciones con los factores geológicos, sedimentológicos i diagenéticos.* Tesi Doctoral, Univ. de Barcelona.

QUEROL X., CHINCHÓN J. S. i LÓPEZ SOLER, A. (1989) Iron sulfide precipitation sequence in Albian coals of the Maestrazgo Basin, southeastern Iberian Range, northeastern Spain. *Int. J. Coal Geol.* 171-189.

QUEROL X., FERNÁNDEZ TURIEL J.L., CHINCHÓN J. S. i LÓPEZ SOLER A. (1990) Paragenetic sequence during deposition and diagenesis in lower Cretaceous coal seams of NE Spain. *15th General Meeting of the International Mineralogical Association* 728-730. Beijing, China.

QUEROL X., SALAS R., PARDO G. i ARDEVOL L. (1991a) Albian coal-bearing deposits of the Iberian Range in NE Spain. A *The controls on distribution and quality of Cretaceous coals* (eds. McCabe P. i Parrish J.).

QUEROL X., FERNÁNDEZ TURIEL J.L., LÓPEZ SOLER A., HAGEMANN H. W., DEHMER R. JUAN i RUIZ C. (1991b) Distribution of sulfur in coals of the Teruel Mining District, Spain. *Int. J. Coal Geol.* **18**, 327-346.

QUEROL, X., CABRERA, L., PICKEL, W., LÓPEZ-SOLER, A., HAGEMANN, H. W., FERNÁNDEZ TURIEL, J.L. (1996) Geological controls on the quality of the Mequinenza subbituminous coal deposit, northeast Spain. *Int. J. Coal Geol.* **29**, 67-91.

QUIRK, M.M., WARDROPER, A.M.K., WHEATLEY, R.E.W. i MAXWELL, J.R. (1984) Extended hopanoid in peat environments chemical geology. *Science* **42**, 25-43. Elsevier.

RADKE M. (1987) Organic Geochemistry of aromatic hydrocarbons. *A Adv. Petroleum Geochem.* (eds. Brooks J. i Welte D.), 141-207. Academic Press, Nova York.

RADKE M. (1988) Application of aromatic compounds as maturity indicators in source rocks and crude oils. Marine Petroleum. *Geology* **5**, 224-236.

RADKE M. i WELTE D. H. (1983) The Methylphenanthrene Index (MPI): A maturity parameter based on aromatic hydrocarbons. A *Adv. Org. Geochem.* 1981 (eds. Bjoroy M. et al.,), 504-512. Wiley & Sons; Nova York.

RADKE M., WILLSCH H., LEYTHAEUSER D. i TEICHMULLER M. (1982) Aromatic components of coal: relation of distribution pattern to rank. *Geochim. Cosmochim. Acta* **46**, 1831-1848.

RAMANAMPISOA L. R., RADKE M. (1995) Extractable aromatic hydrocarbons in a short-term organic cycle of the Kimmeridge Clay formation, Yorkshire (U.K.): relation to primary production and thermal maturity. *Org. Geochem.* 23, 803-817.

RINALDI G. G. L., LEOPOLD V. M. i KOONS C. B. (1988) Presence of benzohopanes, monoaromatic secohopanes and saturated hexacyclic hydrocarbons in petroleum from carbonate environments. A *Biochemical Biomarkers* (eds. Yen T. F. i Moldowan M.), 331-335. Harwood Academic, Chus.

RIÓLO J. i ALBRECHT P. (1986) Novel rearranged ring C monoaromatic steroid hydrocarbons in sediments and petroleums. *Tetrahedron Lett.* **26**, 2701-2704.

RIÓLO J., HUSSLER G., ALBRECHT i CONNAN J. (1986) Distribution of aromatic steroids in geological samples: Their evaluation as geochemical parameters. A *Adv. Org. Geochem.* 1985. *Org. Geochem.* **1**, 981 -990.

DE ROSA M., GAMBACORTA A. i MÍNALE L. (1973) Isoprenoids of *Bacillus acidocalarius. Phytochemistry* **12,** 1117-1123.

DE ROSA M., GAMBACORTA A., MÍNALE L. i BUILOCK J. P. (1971) The formation of co-cyclohexyl fatty acids from shikimate in *acidophilic thermophilic Bacillus. Biochem. J.* **128,**751-754.

ROWLAND S. **J.** (1989) Production of acyclic isoprenoid hydrocarbons by laboratory maturation of methanogenic bacteria. *Org. Geochem.* **15,** 9-16.

ROWLAND S.J., YON D.A., LEWIS CA. i MAXWELL J.R. (1985) Occurrence of 2,6,10-trimethyl-7-(3-methylbutyl)dodecane and related hydrocarbons in the green alga Enteromorpha prolifera and sediments. *Org. Geochem.* **8**,207-213.

RUBINSTEIN I. i SRAUSZ O.P. (1979) Geochemistry of the thiourea adduct fraction from an Alberta petroleum. *Geochim. Cosmochim. Acta* **43**, 1387-1392.

SÁEZ A. (1987) *Estratigrafía y sedimentologia de las formaciones lacustres del tránsito Eoceno-oligoceno del NE de la Cuenca del Ebro.* Tesi doctoral. Univ. de Barcelona.

SÁEZ A. i RIBA O. (1986) depósitos aluviales y lacustres paleógenos del margen pirenaico catalán de la Cuenca del Ebro. A *Guia de las Excursiones del XI Congr. Esp. de Sedimentol.* **6.** 1-29.

SÁEZ A., INGLÉS M. i PUEYO J .J. (1988) Asociaciones de minerales de la arcilla en depósitos fluvio-lacustres paleógenos del NE de la Cuenca del Ebro. *Com. II Congr. Geol. España,* 193-196.

SAINZ DE SIRIA A. (1988) Els cormófits. A *Registre fòssil* (ed. Gallemí J.). Història Natural dels Països Catalans 15,151-196. Enciclopedia Catalana S. A., Barcelona.

SAIZ-JIMENEZ C. (1994) The origin of alkylbenzenes and thiophenes in pyrolysates of geochemical samples. *Org. Geochem.* **23**, 81 -85.

SCHAEFFER P. (1993) *Marqueurs biològiques de milieux évaporitiques.* Tesi Doctoral, Univ. Louis Pasteur.

SCHAEFFER P. (1995) Geochemical study of macromolecular from sulphur-rich evaporitic. *Org. Geochem.* **23**, 567-581.

SCHAEFFER P., FACHE-DANY F., TRENDEL J. M. i ALBRECHT P. (1993) Polar constituents of organic matter rich marls from evaporitic series of the Mulhouse basin. *Org. Geochem.* **20**,1227-1236.

SCHMID J. C. (1986) *Marqueurs biològiques soufrés dans les pétroles.* Tesi Doctoral, Univ. Louis Pasteur.

SEIFERT W. K. (1980) Impact of Treib's discovery of porphyrins on present day biological markers organic geochemistry. A *Proceedings of the Treibs International Symposium* 1979 (ed. Prashocowsky A.), 13-35. Halbigdruck Publ., Munich.

SEIFERT W. K. i MOLDOWAN J. M. (1978) Applications of steranes, terpanes and source of crude oils. *Geochim. Cosmochim. Acta* **42**, 77-95.

SEIFERT W. K. i MOLDOWAN J. M. (1981) Paleoreconstruction by biological markers. *Geochim. Cosmochim. Acta* **45**, 783-794.

SIMONEIT B. R. T (1977) Diterpenoid compound and other lipids in deep sea sediments and their geochemical significance. *Geochim. Cosmochim. Acta* **41**,463-476.

SIMONEIT B. R. T. (1986) Cyclic terpenoids of the geosphere. A *Biological markers in the sedimentary record* (ed. Johns R. B.), 43-99. Elsevier-Amsterdam.

SIMONEIT B. R. T. i MAZUREK M. A. (1982) Organic matter of the troposphere-II Natural background of biogenic matter in aerosols over the rural Western United States. *Atmospheric Enviroment* **16**, 2139-2159.

SIMONEIT B. R. T., GRIMALT J. O., WANG T. G., COX R. E., HATCHER P. G. i NISSEENBAUM A. (1986) Cyclic terpenoids of contemporary resinous plant detritus and of fossil woods, ambers and coals. *A Adv. Org. Geochem.* 1985 (eds. Leytheauser D. i Rullkotter J.). *Org. Geochem.* **10,** 877-889.

SINNINGHE DAMSTÉ J. S. (1988) *Organically-bound sulphur in the geosphere: A molecular approach.* Tesi Doctoral. Univ. Tec.de Delft.

SINNINGHE DAMSTÉ J. S. (1997) C_{27}-C_{30} neohop-13(18)-ens and their aromatic derivatives in sediments: Indicators for water column stratification?. *Organic Geochemistry Maastricht* 1997 (Forschungszentrum Jülich) 659-660.

SINNINGHE DAMSTÉ J. S. i DE LEEUW J. W. (1990) Analysis, structure and geochemical significaance of organically-bound sulphur in the geosophere: State of the art and future research. *Org. Geochem.* **16**,1077-1101.

SINNINGHE DAMSTÉ J. S., DE LAS HERAS F. X. i DE LEEUW J. W. (1992a) Molecular analysis of sulphur-rich brown coals by flash pyrolysis-gas chromatography-mass spectrometry: the type III-S kerogen. *J. Chromatogr.* **607,** 361-376.

SINNINGHE DAMSTÉ J. S., TEN HAVEN H. L., DE LEEUW J. W. i SCHENCK P. A. (1986) Organic geochemical studies of a Messinian evaporitic basin, northern Apennines (Italy)-II*. Isoprenoid and n-alkyl thiopenes and thiolanes. A *Adv. Org. Geochem.* 1985 (eds. Leytheauser D. i Rullkotter J.). *Org. Geochem.* **10,** 791-805.

SINNINGHE DAMSTÉ J. S., KOCK-VAN DALEN A. C, DE LEEUW J. W., SCHENCK P. A., GUOYING S. i BRASSELL S. C. (1987a) The identification of mono-, di- and trimethyl 2-methyl-2-(4,8,12-trimethyltridecyl) chromans and their significance in the geosphere. *Geochim. Cosmochim. Acta* **51**,2393-2400.

SINNINGHE DAMSTÉ J. S., DE LEEUW J. W., KOCK-VAN DALEN A. C, DE ZEEUW M. A., DE LANGE F., RIJPSTRA W. I. C, SCHENCK P. A (1987b) The identification of series of organic sulphur compounds in oils and sediment extracts. I. A study of Rozel Point (USA). *Geochim. Cosmochim. Acta* **51**, 2369-2391.

SINNINGHE DAMSTÉ J. S., RIJSTRA W. I. C, DE LEEUW J. W. i SCHENCK P. A. (1989). The occurrence and identification of series of organic sulphur compounds in oils and sediments extracts. II. Their presence in samples from hypersaline and non-hypersaline depositional environments and possible application as source, maturity and paleoenvironmental indicators. *Geochim. Cosmochim. Acta* **53**,1323-1341.

SINNINGHE DAMSTÉ J. S., DE LAS HERAS F. X., VAN BERGEN P.F. i DE LEEUW J. W. (1992a) Characterization of Tertiary Catalan lacustrine oil shales: Discovery of extremely organic sulphur-rich Type I kerogens. *Geochim. Cosmochim. Acta* **57**, 389-415.

SINNINGHE DAMSTÉ J. S., KEELY B. J., BETTS S. E., BAAS M. i MAXWELL J. R. (1993) Variations in abundances and distributions of isoprenoid chromans and long-chain alkylbenzenes in sediments of the Mulhouse Basin: a molecular sedimentary record of palaeosalinity. *Org. Geochem.* **20**,1201-1215.

SMITH J. W., GEORGE S. C. i BATTS B. D. (1995) The geosynthesis of alkylaromatics. *Org. Geochem.* **23**,71-80.

SOLÉ DE PORTA N. i DE PORTA J. (1984) Etat actuel des connaissances palynologiques du Tertiaire de l'Espagne. *Rev. Paléobiol.* **Spec,** 209-219.

STACH E. (1982) A *Coal Petrology* (ed. Gebrüder Borntraeger). Stuttgart.

STEINER R., SCHAFÈR W., BLOS I., WIESCHOFF H. i SCHEER H. (1981) A2,10-phytadienol as esterifying alcohol of bacteriochlorophyll by from *Ectothiorhodospira halochloris. Z. Naturforsch.* **36c,** 417-420.

STRACHAN M .G., ALEXANDER R. i KAGI R. I. (1988) Trimethylnaphthalenes in crude oils and sediments: Effects of source and maturity. *Geoehim. Cosmoehim. Acta* 52,1255-1264.

SUKH DEV (1989) Terpenoids. A *Natural Products ofWody Plants* (ed. Rowe J. W.), 1, 691-807. Springer, Berlin.

SUMMONS R. E. i WALTER M. R. (1990) Molecular fossils and microfossils of prokaryotes and protists from Proterozoic sediments. *Am. Jour. Scienc.* **290,** 212-244.

SUMMONS R. E., POWELL T. G. i BOREHAM Ch. J. (1988a) Petroleum geology and geochemistry of the Middle Proterozoic McArthur Basin, Northern Australia: III. Composition of extractable hydrocarbons. *Geoehim. Cosmoehim. Acta* **52**, 1747- 1763.

SUMMONS R. E., BRASELL S. C, EGLINTON G., EVANS E., HORODYSKY R. J., ROBINSON N. i WARD D. M. (1988b) Distinctive hydrocarbon biomarkers from fossiliferous sediment of the Late Proterozoic Walcott Member, Chuar Group, Grand Canyon, Arizona. *Geoehim. Cosmoehim. Acta* **52**, 2625-2637.

TEGELAAR E. W., DE LEEUW J.W., DERENNE S. i LARGEAU C. (1989) A reappraisal of kerogen formation. *Geoehim. Cosmoehim. Acta* **53**, 3103-3106.

TISSOT B. P. i WELTE D. H. (1984) *Petroleum formation and occurrence.* Springer-Verlag, Berlin.

TISSOT B., DEROO G. i HOOD A. (1978) Geochemical study of the Uinta Basin: formation of petroleum from the Green River Formation. *Geochim. Cosmochim. Acta* **42,** 1469-1485.

UGURSAL I., AL TAWEEL A. M., HAMDULLAHPUR F., ÖZIL E. IUYAR T. S. (1994) Economics of coal utilization. A *Coal Resources, Properties, Utilization, Pollution* (ed. Orhan Kural), 417-43 0. Istanbul.

UTRILLA R. (1989) Les composicions isotòpiques ($\delta^{18}O$, $\delta^{34}S$) del sulfat, com a indicadors de l'origen de les evaporites del Mesozoic i de Cenozoic de la Península Ibérica i les Illes Balears. *Tesi doctoral,* Univ. de Barcelona.

VALISOLALAO, J., PERAKIS N., CHAPPE, B. i ALBRECHT P. (1984) A novel sulfur containing C_{35} hopanoid in sediments. *Tetrahedron Lett.* **24,**1183-1186.

VASSILAROS D. L., KONG R. C, LATER D. W. i LEE M. L. (1982) Linear retention index system for polycyclic aromatic compounds. Critical evaluation and additional indices. *J. Chromatogr.* **252,**1-20.

VINK A., SCHOUTEN S. i SINNINNGHE DAMSTÉ J.S. (1997) Unusual isoprenoidal carbon skeletons in the lower Albian niveau paquier black shale (Vocontian basin; SE France). *Organic Geochemistry Maastricht* 1997, 661-662.

VOLKMAN J. K. (1986) A review of sterols for marine and terrigenous organic matter. *Org. Geochem.* **9**, 84-99.

VOLKMAN J. K., BARRETT S. M. DUNSTAN G. A. i JEFFREY S. W. (1993) Geochemical significance of the occurrence of dinosterol and other 4-methyl sterols in a marine diatom. *Org. Geochem.* **20**, 7-15.

WYATT A. (1986) *Electric Power challenges and choices.* The Book Press Lted.

WAKEHAM S.G., HOWES B.L. i DACEY J.W.H. (1984) Dimethylsuphide in a stratified coastal salt pond. *Nature* **310,** 770-772.

WANG T.G., SIMONEIT B.R.T., PHILP R.P. i YU C.P. (1990) Extended 8(H)-drimane and 8,14-Secohopane series in a Chinese boghead coal. *Energia & Fuels* **4**, 177-183.

WHITE C. M., DOUGLAS L. J., ANDERSON R. R., SCHMIDT C. E. i GRAY R. J. (1990) On the nature of organosulfur constituents in Rasa coal. A *Geochemistry of Sulfur in Fossil Fuels* (eds. Orr W. L. i White C. M.) ACS Symposium Series. Am. Chem. Soc. Washington.

WHITE C. M., COLLINS L. W., VELOSKI G. A., IRDI G. A. i ROTHENBERGER K. S. (1993) A study of Mequinensa lignite. *Energy & Fuels.*

WHITE C. M., COLLINS L. W., VELOSKI G. A., IRDI G. A. i ROTHENBERGER K. S., GRAY R. J., LACOUNT R. B., KASRAI M., BANCROFT G. M., BROWN J. R., HUGGINS F. E., SHAH N. i HUFFMAN G. P. (1994) A study of Mequinensa lignite. *Energy & Fuels,* **8**,155-171.

WILLIAMS J. A., DOLCATER D. L., TORKELSON B. E. i WINTERS J. C. (1988) Anomalous concentrations of specific alkylaromatic and alky Icy cloparaffin components in West Texas and Michigan crude oils. A *Adv. Org. Geochem.* 1987 (eds. Mattanell L. i Novelli L.). *Org. Geochem.* **13,** 47-59.

WOLFF G. A., LOHMANN F., ASMUWAHYU SAPTORAHARDJO, RIES-KAULT M., TRENDEL J. i ALBRECHT P. (1987) The occurrence of a monoaromatic lupane derivative in geological samples. *13th International Meeting on Organic Geochemistry* (Europ. Assoc. Org. Geochem.) *Abstract* 315. Venècia.