

Laboratory of mass spectrometry and gas chromatography

Prof. Dr. Monica Culea

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Equipments



1. Gas chromatograph-mass spectrometer (GC-MS) - Thermo Quest, Trace D5Q/2000 equipped with autosampler for headspace, liquids, SPME.
2. Gas chromatograph coupled with ion trap mass spectrometer - Polaris Q, (MS/MS)5, equipped with autosampler.
3. Gas chromatograph - Agilent 6890, FID and ECD detectors.
4. UV-VIS spectrometer, Perkin Elmer



Mass spectrometer (Thermo Firigan Trace D5Q) coupled with gaz chromatograph (Trace GC) and the ionic trap mass spectrometer (Polaris Q Mass Spectrometer MS/MS) coupled with GC.



UV-VIS spectrometer (Perkin Elmer).



Gas chromatograph (Agilent 6890).



Prof. Dr. Monica Culea

PhD students: Andreea Iordache, Elena Horj, Diana Florescu, Alina Toma



PhD students: Elena Horj, Andreea Iordache, Diana Florescu



Prof. Dr. Monica Culea (middle) and PhD students from left: Diana Florescu, Alina Toma, Andreea Iordache, Elena Horj



LABORATORY OF MASS SPECTROMETRY AND GAS CHROMATOGRAPHY

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Publications (last three years):

I. PUBLICATIONS IN REFEREED JOURNALS

1. Cornelia Mesaros, Monica Culea, Andreea Iordache, Onuc Cozar, Constantin Cosma, A new caffeine test for diagnosis of cirrhosis by Gas Chromatography coupled to Mass Spectrometry, *Asian J Chem*, vol.22.no.5,3608-3614(2010).
2. Dual role of the six-coordinated molybdenum and lead ions in novel of photochromic properties of the molybdenum-lead-borate glasses Rada, M., Maties, V., Culea, M., Rada, S., Culea, E. *Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy* 75 (2), pp. 507-510 (2010,).
3. Competitive role of the tellurium and gadolinium cations in structural aspects of the gadolinium-phosphate-tellurate glasses Rada, S., Culea, M., Rada, M., Rusu, T., Culea, E. *Journal of Alloys and Compounds*, 490,270-276 (2010).
4. Amino Acid Composition of Two Carp Species by GC-MS, A. Iordache, E. Horj A. Toma, O. Cozar, M. Culea, *Asian J Chem*, vol.23, no.11, 4757 – 4760, 2011.
5. Determination of Amino Acid and Selenium in Fish Plasma, A. Iordache, M. Culea, E. Horj, O. Cozar, *Rom. J. Phys.*, vol.56, nr.7-8, 963-971, 2011.
6. Determination of Fatty Acid Composition of Two Carp Species by GC-MS, E. Horj, A. Iordache, A. Toma, O. Cozar, M. Culea, *Asian J Chem*, vol.23,nr. 11, 4768 – 4770, 2011
7. Determination of glycine in biological fluids by isotopic dilution mass spectrometry, M. Culea, E. Horj, A. Iordache, O. Cozar, *Asian J Chem*, vol.23, 2011, 4279-4281.
8. Dinuclear manganese centers in the manganese-lead-tellurate glasses. Rada S; Dehelean A; Culea M; Culea E, *Spectrochimica acta. Part A, Molecular and biomolecular spectroscopy*, 2011;79(2):320-4
9. Isotopic Dilution GC/MS Method for Methionine Determination in Biological Media, Horj Elena; Iordache Andreea; Culea Monica, *AIP Conf. Proc.* 1387, 241-246 (2011) p. 241-246, doi:10.1063/1.3647081
10. D. Florescu, R.E. Ionete, A. Iordache, E. Horj, I. Stefanescu, M. Culea, Optimal measurements of surface water pollutants Case of study on southern part of Romania, *Asian J Chem*, 23, 12, 5209-5212, 2011
11. Comparison of three digestion methods for heavy metals determination in soils and sediments materials by ICP-MS technique, E.I. Geana, A.M. Iordache, C. Voica, R.E. Ionete, M. Culea, *Comparison Asian J Chem*, 23, 12, 5213-5216, 2011
12. The improvement of the amorphous environment of the germanate-tellurate glasses in the presence of the gadolinium ions, S. Rada • R. Chelcea • M. Culea • E. Culea *J Mater Sci* (2011) 46:1289–1294
13. Diagnosis and monitoring by GC/MS, Monica Culea, Elena Horj, Diana Florescu, Andreea Iordache, Cornelia Mesaros, *Romana Vulturar,Chemicke-listy*, 2011, p. 1047-1048, 0009-2770 (ISSN)
14. Leucine transmembranar transport study in the human red cell, Elena Horj, Diana Florescu, Andreea Iordache, Silvia Neamțu, Monica Culea, *Chemicke-listy*, 2011, p. 1048-1049, 0009-2770 (ISSN)
15. The Influence of Pollution Monitoring Parameters in Characterizing the Surface Water Quality from Romania Southern Area, Diana Florescu, Roxana Elena Ionete, Claudia Sandru, *Andreea Iordache, Monica Culea, Romanian Journal of Physics*, vol. 56, 7-8, 1001-1010,2011, ISSN 1221-146X

16. Interlaboratory study to improve the quality of trace element determinations in surface waters, Claudia Sandru, Irina Geana, Andreea Iordache, Cezara Voica, Diana Florescu, Roxana Elena Ionete, *Romanian Reports in Physics*, ISSN 1221-1451
17. Low-levels specification of elements in drinking waters using ICP-MS, Andreea Iordache, Diana Florescu, Roxana Ionete, Monica Culea „*Chemicke Listy*“, 105, 18, s1039, 2011, ISSN 1213-7103, 0009-2770 (printed), 1803-2389 (CD-ROM), Brno, Cehia
18. The potentialities of multi-element composition and $87\text{Sr}/86\text{Sr}$ ratio of wine provenance, Andreea Iordache, Cezara Voica, Diana Florescu, Roxana Ionete, Monica Culea, *Chemicke Listy*, 105, 8, s1038, 2011, ISSN: 1213-7103, 0009-2770 (printed), 1803-2389 (CD-ROM), Brno, Cehia
19. Investigation and monitoring of ambient pollutants of atmosphere from in situ collected samples in an industrial area, Diana Florescu, Andreea Iordache, Gili Saros, Felicia Bucura, Marius Constantinescu, Roxana Ionete, Monica Culea, *Chemicke Listy*, 105, 8, s 985, 2011, ISSN: 1213-7103, 0009-2770 (printed), 1803-2389 (CD-ROM), Brno, Cehia
20. Trace of heavy metals in fish tissues, sediment and water from Danube river in Romania, Diana Florescu, Andreea Iordache, Elena Horj, Roxana Ionete, Claudia Sandru, Monica Culea, *Chemicke Listy*, 105, 8, s 984, 2011, ISSN: 1213-7103, 0009-2770
21. SIM-GC/MS determination of BTEX in ambient air, Diana Florescu, Andreea Iordache, Elena Horj, Roxana Ionete, Ioan Stefanescu, Monica Culea, *Chemicke Listy*, 105, 8, s984, 2011, ISSN: 1213-7103, 0009-2770 (printed), 1803-2389 (CD-ROM), Brno, Cehia
22. Fatty acids determination in biological samples by GC-MS, Andreea Iordache, Diana Florescu, Elena Horj, Monica Culea, *Chemicke Listy*, nr.105, s 1015, 2011, ISSN 1213-7103, 0009-2770 (printed), 1803-2389 (CD-ROM), Brno, Cehia
23. Amino acids determination in dry fermented salami, Monica Culea, Elena Horj, Andreea Iordache, Diana Florescu, *Chemicke Listy*, nr.105, s 1047-s 1048, 2011, ISSN 1213-7103, 0009-2770 (printed), 1803-2389 (CD-ROM), Brno, Cehia
24. Evaluation and differentiation of the Betulaceae birch bark species and their bioactive triterpene content using analytical FT-vibrational spectroscopy and GC-MS, Simona Cinta-Pinzaru, Cristina A Dehelean, Codruta Soica, Monica Culea, Florin Borcan, *Chemical Central Journal*, 2012,6,67-
25. ICP-MS multi-element analysis of certain Romanian wines and their provenance soils for geographical origin determination”, Geana Irina, Andreea Iordache, Roxana Elena Ionete, Adrian Marinescu, Aurora Ranca, Monica Culea *Food Chemistry*, Elsevier, ISSN 0308-8146, vol.138,2013,1125-1134
26. Validation procedure for assessing total organic carbon in water samples, Diana Florescu, Andreea Iordache, Diana Costinel, Elena Horj, Roxana Ionete, Monica Culea *Romanian Journal of Physics*, vol. 58, nr. 1-2, pag. 211-219, 2013, ISSN 1221-146X, <http://www.nipne.ro/rjp/c>.

II. JOURNALS OF THE ROMANIAN ACADEMY:

1. Daniel COCAN, Elena HORJ, Monica CULEA, Vioara MIRESAN, Adela PINTEA, Amino Acids Levels of Rainbow Trout (*Oncorhynchus mykiss*) Plasma During Spring – Summer Seasons, *Bulletin of USAMV, Cluj-Napoca, Agriculture*, vol.67(1-2)132-136, ISSN 1843-5246, Electronic ISSN 1843-5386 (2010).
2. Daniel COCAN, Elena HORJ, Monica CULEA, Vioara MIRESAN, Adela PINTEA, Variation of Free Fatty Acid in Rainbow Trout (*Oncorhynchus mykiss*) Plasma During Spring – Summer Seasons, *Bulletin of*

- USAMV, Clyj-Napoca, Agriculture, vol.67(1-2)137-141, ISSN 1843-5246, Electronic ISSN 1843-5386(2010).
3. Codrean POP, Levente BARA, Elena HORJ, Andreea IORDACHE, Cornel LASLO, Monica CULEA, Determination of free fatty acids in sausage meat Bulletin of USAMV, Agriculture, vol.67(2)373-377, ISSN 1843-5246, Electronic ISSN 1843-5386(2010).
 4. Levente BARA1), Codrean POP1), Elena HORJ2), Andreea IORDACHE2), Cornel LASLO1), Monica CULEA2), Amino acids determination in meat by GC-MS, Bulletin of USAMV, Clyj-Napoca, Agriculture, vol.67(2)162-167, ISSN 1843-5246, Electronic ISSN 1843-5386(2010).
 5. Andreea Iordache, Claudia Sandru, Irina Geana, Levente Bara, Roxana Ionete, Monica Culea, Metal Concentrations in Sediment and Fish from Topalu Area , Bulletin of USAMV, Clyj-Napoca, Agriculture, vol.67(1-2) 459-460, ISSN 1843-5262, Electronic ISSN 1843-536X (2010).
 6. Cornelia Mesaros, Andreea Iordache, O. Cozar, C. Cosma, Monica Culea, Diagnosis by Mass Spectrometry, Rom. J. Biophys. 20(1): 71-82 (2010).
 7. Stăncuța Scrob, Sevastița Muste, Monica Culea, GC/MS analysis of fatty acids in some corn inbred lines, Rom. J. Biophys. 2013 23(1-2): 000-000.

III. PUBLICATIONS IN CONFERENCE PROCEEDINGS:

1. Amino acid composition of two carp species by GC-MS, Iordache A., E. Horj, A. TOMA, O. Cozar, M. Culea, Proceedings 37th conference of Slovak Society of Chemical Engineering 24-28 MAI 2010, Tatranske Matliare, Slovakia, ISBN 978-80-227-3290-1, 799-809 (2010).
2. Fatty acid composition of two carp species by GC-MS, E. Horj, A. Iordache, A. Toma, O. Cozar, M. Culea, Proceedings 37th conference of Slovak Society of Chemical Engineering 24-28 MAI 2010, Tatranske Matliare, Slovakia,, ISBN 978-80-227-3290-1, 820-829 (2010).
3. Determination of glycine in biological fluids by isotopic dilution mass spectrometry, M. Culea, E. Horj, A. Iordache, O. Cozar Proceedings 37th conference of Slovak Society of Chemical Engineering 24-28 MAI 2010, Tatranske Matliare, Slovakia,, ISBN 978-80-227-3290-1, 810-819 (2010).

IV. BOOKS

1. Medical Physics, M. Culea, cap. 1 Mass spectrometry. Medical applications, pp.1-38, 2013, ISBN: 978-1-62257-590-9, pag. 211
2. C. Mesaros, M. Culea, A.M. Iordache, Diagnosticare prin GC-MS, Risoprint, Cluj-Napoca, 2012, 96p. ISBN:978-973-53-0762-2.
3. A.M. Iordache, M. Culea, C. Mesaros, I. Stefanescu, Aplicatii biomedicale si ecologice prin spectrometrie de masa, Risoprint, Cluj-Napoca, 2012, 159p, ISBN:978-973-53-0784-4

V. CONFERENCES:

1. Iordache A., E. Horj, L. Bara, C. Pop, O. Cozar, M. Culea, Simultaneous Extraction Methods For Amino Acids And Fatty Acids Characterization Of Food, Conf. Fizica Iasi, 2010, Bfm-P13
2. Daniel Cocan, Elena Horj, Monica Culea, Vioara Mireșan, Adela Pinte, Amino Acids Levels Of Rainbow Trout (*Oncorhynchus Mykiss*) Plasma During Spring – Summer Seasons, Simpozionul “Prospects For The 3rd Millenium Agriculture”, 30 Septembrie-2 Octombrie 2010, Bulletin Of Usamv, Clyj-Napoca, Agriculture, VOL.67(1-2)132-136, 2010, ISSN 1843-5262, ELECTRONIC ISSN 1843-536X
3. Daniel Cocan, Elena Horj, Monica Culea, Vioara Mirean, Adela Pinte, Variation Of Free Fatty Acid In Rainbow Trout (*Oncorhynchus Mykiss*) Plasma During Spring – Summer Seasons, Simpozionul

- “Prospects For The 3rd Millenium Agriculture”, 30 Septembrie-2 Octombrie 2010, Bulletin Of Usamv, Cluj-Napoca, Agriculture, Vol.67(1-2)137-141, 2010,Issn 1843-5262, Electronic Issn 1843-536x
4. Codrean Pop1), Levente Bara1), Elena Horj2), Andreea Iordache2), Cornel Laslo1), Monica Culea2, Determination Of Free Fatty Acids In Sausage Meat Simpozionul “Prospects For The 3rd Millenium Agriculture”, 30 Septembrie-2 Octombrie 2010, Bulletin Of Usamv, Agriculture, Vol.67(2)373-377, 2010,Issn 1843-5246, Electronic Issn 1843-5386.(B+, Revista Citata In Thompson Bdi)
 5. Levente Bara1), Codrean Pop1), Elena Horj2), Andreea Iordache2), Cornel Laslo1), Monica Culea2), Amino Acids Determination In Meat By Gc-Ms Simpozionul “Prospects For The 3rd Millenium Agriculture”, 30 Septembrie-2 Octombrie 2010,
 6. Andreea Iordache1), Claudia Sandru1), Irina Geana1), Levente Bara2), Roxana Ionete1), Monica Culea3, Metal Concentrations In Sediment And Fish From Topalu Area , Simpozionul “Prospects For The 3rd Millenium Agriculture”, 30 Septembrie-2 Octombrie 2010, Bulletin Of Usamv, Cluj-Napoca, Agriculture, Vol.67(1-2) 459-460, 2010,Issn 1843-5262, Electronic Issn 1843-536x
 7. Elena Horj, Andreea Iordache, O. Cozar, Monica Culea, Mass Spectrometric Determination Of Methionine And Selenium In Plasma, 2010, Pp 87. Proceeding In-Canmbs Brasov/18-20iunie
 8. Andreea Iordache, E. Horj, A. Toma, O. Cozar, M. Culea, Amino Acid Composition Of Two Carp Species By Gc-Ms, Proceedings 37th Conference Of Slovak Society Of Chemical Engineering 24-28 Mai 2010, Tatranske Matliare, Slovakia, Isbn 978-80-227-3290-1, 799.
 9. E. Horj, A. Iordache, A. Toma, O. Cozar, M. Culea, Fatty Acid Composition Of Two Carp Species By Gc-Ms, Proceedings 37th Conference Of Slovak Society Of Chemical Engineering 24-28 Mai 2010, Tatranske Matliare, Slovakia, Isbn 978-80-227-3290-1, 820.
 10. M. Culea, E. Horj, A. Iordache, O. Cozar, Determination Of Glycine In Biological Fluids By Isotopic Dilution Mass Spectrometry , Proceedings 37th Conference Of Slovak Society Of Chemical Engineering 24-28 Mai 2010, Tatranske Matliare, Slovakia, Isbn 978-80-227-3290-1, 810.
 11. Amino acid composition of two carp species by GC-MS, Iordache A., E. Horj, A. TOMA, O. Cozar, M. Culea, Proceedings 37th conference of Slovak Society of Chemical Engineering 24-28 MAI 2010, Tatranske Matliare, Slovakia, ISBN 978-80-227-3290-1, 799-809 (2010).
 12. Fatty acid composition of two carp species by GC-MS, E. Horj, A. Iordache, A. Toma, O. Cozar, M. Culea, Proceedings 37th conference of Slovak Society of Chemical Engineering 24-28 MAI 2010, Tatranske Matliare, Slovakia,, ISBN 978-80-227-3290-1, 820-829 (2010).
 13. Determination of glycine in biological fluids by isotopic dilution mass spectrometry, M. Culea, E. Horj, A. Iordache, O. Cozar Proceedings 37th conference of Slovak Society of Chemical Engineering 24-28 MAI 2010, Tatranske Matliare, Slovakia,, ISBN 978-80-227-3290-1,810-819 (2010).

VI. CONFERENCES:

1. Iordache A., E. Horj, L. Bara, C. Pop, O. Cozar, M. Culea, Simultaneous Extraction Methods For Amino Acids And Fatty Acids Characterization Of Food, Conf. Fizica Iasi, 2010, Bfm-P13
2. Daniel Cocan, Elena Horj, Monica Culea, Vioara Mireşan, Adela Pinte, Amino Acids Levels Of Rainbow Trout (*Oncorhynchus Mykiss*) Plasma During Spring – Summer Seasons, Simpozionul “Prospects For The 3rd Millenium Agriculture”, 30 Septembrie-2 Octombrie 2010, Bulletin Of Usamv, Cluj-Napoca, Agriculture, VOL.67(1-2)132-136, 2010,ISSN 1843-5262, ELECTRONIC ISSN 1843-536X

3. Daniel Cocan, Elena Horj, Monica Culea, Vioara Mirean, Adela Pinte, Variation Of Free Fatty Acid In Rainbow Trout (*Oncorhynchus Mykiss*) Plasma During Spring – Summer Seasons, Simpozionul “Prospects For The 3rd Millenium Agriculture”, 30 Septembrie-2 Octombrie 2010, Bulletin Of Usamv, Clyj-Napoca, Agriculture, Vol.67(1-2)137-141, 2010,Issn 1843-5262, Electronic Issn 1843-536x
4. Codrean Pop1), Levente Bara1), Elena Horj2), Andreea Iordache2), Cornel Laslo1), Monica Culea2), Determination Of Free Fatty Acids In Sausage Meat Simpozionul “Prospects For The 3rd Millenium Agriculture”, 30 Septembrie-2 Octombrie 2010, Bulletin Of Usamv, Agriculture, Vol.67(2)373-377, 2010,Issn 1843-5246, Electronic Issn 1843-5386.(B+, Revista Citata In Thompson Bdi)
5. Levente Bara1), Codrean Pop1), Elena Horj2), Andreea Iordache2), Cornel Laslo1), Monica Culea2), Amino Acids Determination In Meat By Gc-Ms Simpozionul “Prospects For The 3rd Millenium Agriculture”, 30 Septembrie-2 Octombrie 2010,
6. Andreea Iordache1), Claudia Sandru1), Irina Geana1), Levente Bara2), Roxana Ionete1), Monica Culea3, Metal Concentrations In Sediment And Fish From Topalu Area , Simpozionul “Prospects For The 3rd Millenium Agriculture”, 30 Septembrie-2 Octombrie 2010, Bulletin Of Usamv, Cluj-Napoca, Agriculture, Vol.67(1-2) 459-460, 2010,Issn 1843-5262, Electronic Issn 1843-536x
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9. E. Horj, A. Iordache, A. Toma, O. Cozar, M. Culea, Fatty Acid Composition Of Two Carp Species By Gc-Ms, Proceedings 37th Conference Of Slovak Society Of Chemical Engineering 24-28 Mai 2010, Tatranske Matliare, Slovakia, Isbn 978-80-227-3290-1, 820.
10. M. Culea, E. Horj, A. Iordache, O. Cozar, Determination Of Glycine In Biological Fluids By Isotopic Dilution Mass Spectrometry , Proceedings 37th Conference Of Slovak Society Of Chemical Engineering 24-28 Mai 2010, Tatranske Matliare, Slovakia, Isbn 978-80-227-3290-1, 810.

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LANGUAGES: English, French

EDUCATION: 1970-1975: University Cluj-Napoca Faculty of Physics Degree - Master of
Science
1990-1993: Program: Analytical Applications of Mass Spectrometry
Degree - Doctor of Philosophy Area of Study - Isotopic dilution quantitative
MS

**PROFESSIONAL AND
TEACHING EXPERIENCE:** 1975 - 1978: Mechanical Plant, Cluj-Napoca, productive experience
1979-1997: Institute of Isotopic and Molecular Technology, Cluj-Napoca
Area: Isotopic mass spectrometry, structural analysis of organic compounds
using high resolution MS, metastable analysis, quantitative determination by
isotopic dilution MS and GC/MS, method validation for trace analysis
2/92 - 12/92: Welcome research fellow Training at Children's Nutrition
Research Center, Baylor College of Medicine, Houston, Texas, USA
Program: "Applications of stable isotope tracer in human nutrition research"
9/1994 –2002: Associate Professor Department of Atomic Physics
4/1997 –2002: SC NATEXs.r.l. Area: Food, beverage, analysis of natural
extracts by GC and GC/MS.
10/2002 Lecturer Biomedical Physics Department "Babes-Bolyai" University
Cluj-Napoca
10/2005 Assoc. Professor
10/2008 Professor.

TEACHING EXPERIENCE: 1990 to present: Supervisor of graduate student research and PhD adviser
1993-1994: General Physics. 1993-present: Experimental methods in atomic
and molecular physics, Ambient protection, Ecology, pollutants, biomedical
applications.
2002 to present Biophysics, Dosimetry and Radioprotection,

- Structural studies by GC/MS and metastable measurements
- Quantitative analysis of amino acids using ID-GC/MS for biochemical applications
- Quantitative analysis of fatty acids by GC and GC/MS
- transmembranar transport study, malabsorption and biochemical applications.
- Pharmacokinetic studies of anaesthetics (procaine), theophylline and caffeine in plasma and saliva.
- UL 13C -cholesterol synthesis for metabolic study.
- Quantitative determination of VOCs, BTEX, nicotine and organophosphoric pesticides in air, water and soil.

RESEARCH ACTIVITIES:

- Natural extracts characteriation. Food and beverage analysis. Active principle extraction and characterization in herbs and red wines.
 - Trihalomethanes (THMs) determination in drinking water by headspace-GC-MS; interlaboratory studies to compare headspace-GC-MS, LC-GC-MS, headspace-GC-ECD, purge&trap-GC-MS; laboratory kinetic studies;
 - Metabolic diseases diagnosis by using biomarkers (amino acid fingerprint for PKU, MSUD, caffeine for cirrhosis, breath markers)
 - Biotechnological applications: free amino acids and fatty acids characterization during fermentation steps of salami, yogurt, cheese
- Keywords: GC/MS, SIM-GC-MS, isotopic dilution, quantitative analysis, method validation, amino acids, fatty acids, transmembranar transport, pharmacokinetic studies, drugs, diagnosis, VOCs, BTEX, THMs, environmental tobacco smoke, pesticides, pollutants, headspace, aroma, herbs.

Romanian Society of Physics

European Society of Physics

MEMBERSHIPS':

Romanian Society of Biophysics

Romanian Society of Analitical Chemistry

Romanian Society of Mass spectrometry

International Society of Built Environment, (Comity member)

1992 Diploma of International Agency of Atomic Energy

HONORS:

1986 Diploma of FEBS advanced courses "Biomembranes and diseases"

1997 Diploma of FiaTest "Quality Systems"

1999-2000,

2010 Who's Who in the World

233 publications, 248 conferences