University of the
Balearic Islands

The
Electronic Engineering Group

Dr. Eugenio Garcia Moreno

Outline

- The University of the Balearic Islands (UIB)
- The Electronic Engineering Group (EEG)
- Radiation sensors

The Campus of the UIB

The UIB

The UIB

UIB. Historic dates

- 1483 Estudi General Lul·lià
- 1681 Universitat Lul·liana de Mallorca
- 1772 Universitat Literària de Mallorca
- 1829 the university was closed
- 1951 Estudi General Lul·lià
- 1978 Universitat de les Illes Balears

UIB: Degrees

ENGINEERING & ARCHITECTURE

ARTS AND HUMANITIES

HEALTH SCIENCES

SOCIAL & LEGAL SCIENCES

SCIENCES

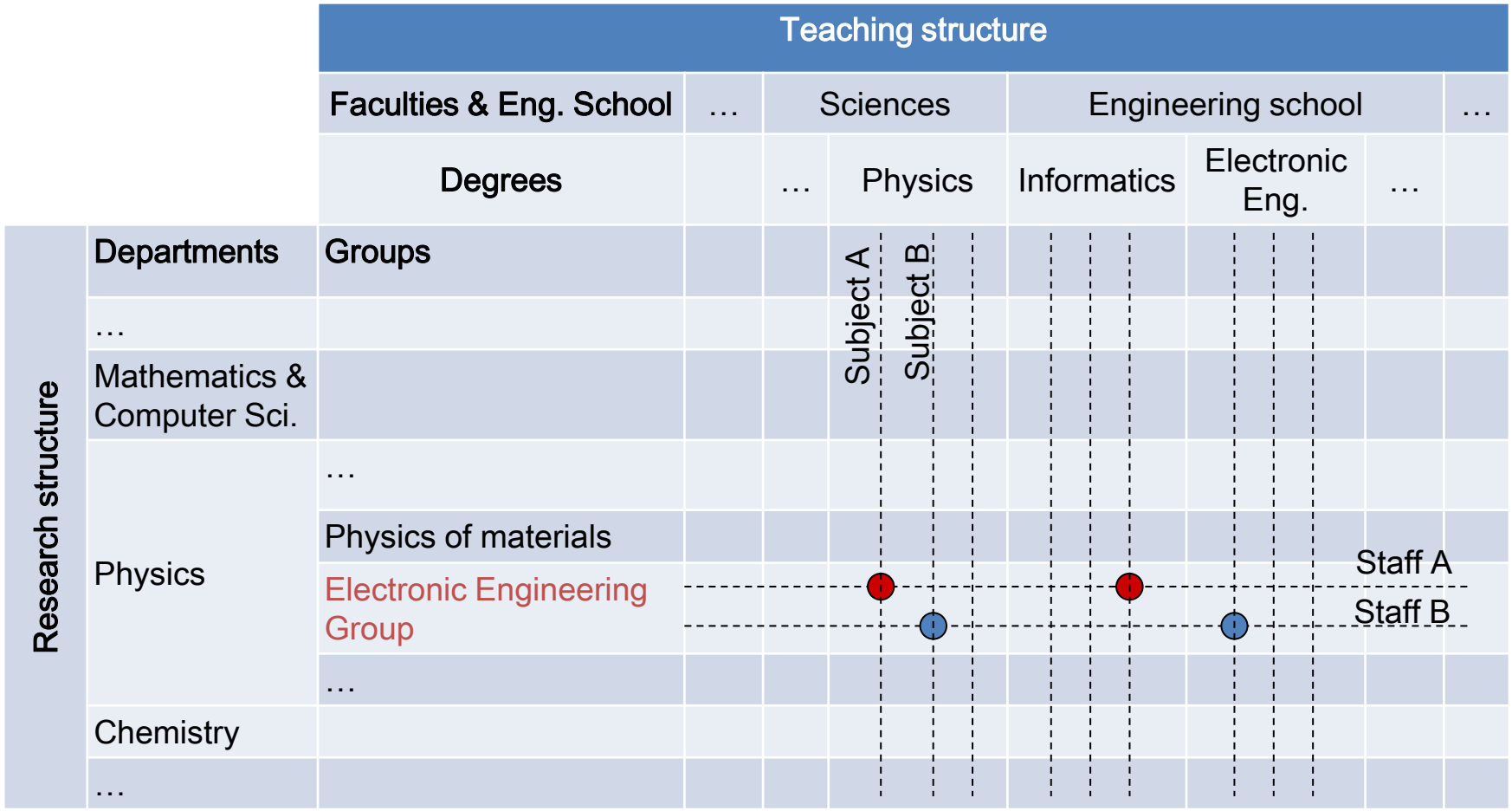
UIB: Figures

Registered students

Degree……..	14.000
Masters and Doctorate (Official) ……	1.900
Other Postgraduate Programmes ..……	1.639
Continuous training activities and courses & Senior University ……	2.675
Teaching Staff…….	**1.218**
Administration Staff…….	**685**

BUDGET 2012 88.300.000 €

UIB: Teaching staff structure



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- The University of the Balearic Islands (UIB)
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EEG: members

- Principal researcher
  - Dr. Eugenio García Moreno (Professor)
- Senior (Ph D) researchers
  - Dr. Joan Font Rosselló (Associate professor)
  - Dr. Eugenio Miguel Isern Riutort (Associate professor)
  - Dr. Rodrigo Picos Gayá (Associate professor)
  - Dr. Miguel Jesús Roca Adrover (Associate professor)
  - Dr. José Luis Rosselló Sanz (Associate professor)
  - Dr. David Camarero de la Rosa (Technician)
- Junior (non.PhD) researchers
  - Sra. Manal Lagziri
  - Sr. Antoni Morro Gomila
  - Sr. Miquel Lleó Alomar Barceló
  -
- Col·laboradors
  - Dr. Vicente J. Canals Guinand
  - Dr. Alejandro Fabian Rozenfeld
  - Dr. Kay Suenaga Português
  - Sr. Andre Luis Sousa Sena

EEG: activities

- Teaching duties (degrees)
  - Technical Engineer in Telecommunications, specializing in Telematics
  - Technical Industrial Engineering, specializing in Industrial Electronics
  - Technical Engineering in Computer Systems
  - Physics
- Research fields
  - Design and test of integrated circuits
  - Device modeling and characterization
  - Electronic instrumentation

EEG: research facilities

- Microprobe station to direct wafers access
- Integrated circuits Computer Aided Design tool (Cadence)
- Advanced electronic Instrumentation
  - Logic analyzer
  - RF facilities: generator, spectrum analyzer, network analyzer
  - Semiconductor device analyzer
  - Electronic instrumentation bench controlled by GPIB
- Climatic chamber

EEG: recent founded projects

- TEC2011-23113. Development and implementation of computer systems using very high speed pulsating networks and its application to the search for new drugs. Founded by MEC Responsible: J. L. Rosselló Sanz
- IDI-20101454. Radiation dosimeter compatible with standard CMOS technologies. Founded by CDTI/IC-Málaga Responsible: E. Garcia Moreno
- TEC2009-07859. Optimization of the behavior of integrated circuits based on predictive test (PRONTEC). Founded by MEC Responsible: E. Garcia Moreno
- UIB contract. Feasibility study of new technologies of concentration for photovoltaic generation.Founded by Govern Balear/Sampol S.L. Responsible: E. Garcia Moreno
- AECI cooperation project with Jordan University of Science and Technology Founded by AECI (MEC) Responsible: R. Picos Gayà
- UIB-ENDESA Contract. Catedra Energy Innovation. Founded by ENDESA Responsible : M. Roca Adrover

EEG: publications

- J.L. Rossello, V. Canals, A. Morro, A. Oliver, “Hardware Implementation of Stochastic Spiking Neural Networks”, International Journal of Neural Systems, Vol. 22, No. 4, pp. 12-14, 2012
- Garcia-Moreno, E., Isern, E., Roca, M., Picos, R., Font, J., Cesari, J., Pineda, A., “Floating gate CMOS dosimeter with frequency output”, IEEE Transactions on Nuclear Science, Vol. 59, No. 2, pp. 373-378, 2012
- Picos, R., Garcia-Moreno, E., Roca, M., Iniguez, B., Estrada, M., & Cerdeira, A., “Optimised design of an organic thin-film transistor amplifier using the g m/I D methodology”, IET Circuits, Devices and Systems, Vol. 6, No. 2, pp. 136-140, 2012
- Papadopoulos, N. P., Marsal, A., Picos, R., Puigdollers, J., & Hatzopoulos, A. A., “Simulation of organic inverter”, Solid-State Electronics, Vol. 68, pp. 18-21, 2011
- Merino, J.L. , Bota, S.A., Picos, R., Segura, J., “Alternate characterization technique for static random-access memory static noise margin determination, International Journal of Circuit Theory and Applications, 2012
- Font-Rosselló, J., Isern, E., Roca, M., Picos, R., Font-Rosselló, M., García-Moreno, E., “Band-pass filter design with diagnosis facilities based on predictive techniques”, Journal of electronic testing-theory and applications, Vol. 27, No. 6, pp. 685-696, 2011
- Papadopoulos, N.P , Hatzopoulos, A.A., Marsal, A., Puigdollers, J., Picos, R., “Current and voltage simulation of an organic inverter”, International Journal of High Speed Electronics and Systems, Vol. 20. No. 4, pp. 843-851, 2011

EEG: publications

- Picos, R., Garcia-Moreno, E., Estrada, M., Cerdeira, A., Iñiguez, B., “Effect of process variations on an OTFT compact model parameters”, International Journal of High Speed Electronics and Systems, Vol. 20, No. 20, pp. 815-828, 2011
- Canals, V., Morro, A., Rosselló, J.L., “Stochastic-based pattern-recognition analysis”, Pattern Recognition Letters, Vol. 31, No. 15, pp. 2353-2356, 2010
- Suenaga, K., Isern, E., Picos, R., Bota, S., Roca, M., García-Moreno, E., “Application of predictive oscillation-based test to a CMOS OpAmp”, IEEE Transactions on Instrumentation and Measurement, Vol. 59, No. 8, 2010
- Torrens, G., Alorda, B., Barceló, S., Rosselló, J.L., Bota, S.A. , Segura, J., “Design hardening of nanometer SRAMs through transistor width modulation and multi-vt combination”, IEEE Transactions on Circuits and Systems II: Express Briefs, Vol. 57, No. 4, pp. 280-284, 2010
- Estrada, M., Cerdeira, A., Mejia, I., Avila, M., Picos, R., Marsal, L.F., Pallares, J., Iñguez, B., “Modeling the behavior of charge carrier mobility with temperature in thin-film polymeric transistors”, Microelectronic Engineering, Vol. 87, No. 12, pp. 2565-2570, 2010
- Rossello, J.L. , Canals, V., Morro, A., Verd, J., “Chaos-based mixed signal implementation of spiking neurons”, International Journal of Neural Systems, Vol. 19, No. 6, pp. 465-471, 2009

EEG: publications

- García-Moreno, E.; Picos, R.; Isern, E.; Roca, M.; Bota, S.; Suenaga, K., "Radiation Sensor Compatible with Standard CMOS technology", "IEEE Transactions on Nuclear Science", Vol. 56, No. 5, pp. 2910-2915 , 2009
- Balado, L.; Lupon, E.; Figueras, J.; Roca, M.; Isern, E.; Picos, R., "Verifying Functional Specifications by Regression Techniques on Lissajous Test Signatures", IEEE Trans. On Circuits And Systems i-Regular Papers, Vol. 56, pp. 754-762, 2009
- Nikolas P. Papadopoulos, Alkis A. Hatzopoulos, Dimitris K. Papakostas, Rodrigo Picos, C.A. Dimitriadis, S. Siskos, "A Light-impact model for p-type and n-type poly-TFTs", Journal Of Display Technology, Vol. 5, No. 7, pp. 265-272, 2009
- García-Moreno, E.; Suenaga, K.; Picos, R.; Bota, S.; Roca, M.; Isern, E., "Predictive test strategy for CMOS RF mixers", Integration-The VLSI Journal", Vol. 42, No. 1, pp. 95-102, 2009
- Nikolas P. Papadopoulos, Alkis A. Hatzopoulos, Dimitris K. Papakostas, Rodrigo Picos, C.A. Dimitriadis, S. Siskos, "A Light-impact model for p-type and n-type poly-TFTs", Journal Of Display Technology, Vol. 5, No. 7, pp. 265-272, 2009
- García-Moreno, E.; Suenaga, K.; Picos, R.; Bota, S.; Roca, M.; Isern, E., "Predictive test strategy for CMOS RF mixers", Integration-the Vlsi Journal, Vol. 42, No. 1, pp. 95-102, 2009

EEG: External collaborations

- In Spain
  - Universidad Rovira i Virgili. Tarragona
  - Universidad Politécnica de Cataluña. Barcelona
  - Universidad de Cartagena. Murcia
- Abroad
  - CINVESTAV (México)
  - INAOE (México)
  - University of Campinas (Brazil)
  - University Simón Bolivar (Venezuela)
  - Technical University of Cluj-Napoca (Romania)
  - University of Thesaloniki (Greece)
  - Fraunhofer Institute for Integrated Circuits, Erlangen, (Germany)
  - Jordan University for Science and Technology (Jordan)

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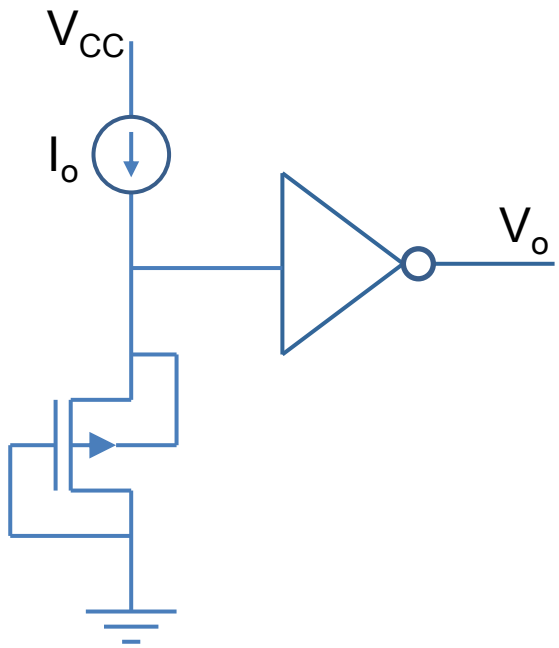
Published papers

- **E. García-Moreno**, R. Alcubilla, L. Prat, L. Castañer, "Radiation damage evaluation on AlGaAs/GaAs solar cells", IEEE Transactions on Nuclear Science, Vol. NS-35, No.4, pp. 1067-1071, 1988
- L. Prat, R. Alcubilla, E. Blasco, **E. García-Moreno**, J. Calderer, X. Correig, L. Castañer, "Perfomance analysis of bifacial silicon solar cells in a space environment", Solar Cells, Vol. 29, pp. 303-318, 1990
- L. Prat, R. Alcubilla, E. Blasco, **E. García-Moreno**, J. Calderer, X. Correig, "Spectral response degradation of bifacial silicon solar cells", Solar Cells, Vol. 31, pp. 47-56, 1991
- **E. García-Moreno**, E. Demaesmeker, M. Ghanam, J. Nijs, "Analysis of solar cell degradation in space using PC-1D", Solar Energy and Solar Cells, Vol. 26, pp. 189-201, 1992
- **E. García-Moreno**, B. Iñiguez, M. Roca, J. Segura and S. Sureda, "CMOS radiation sensor with binary output", IEEE Transactions on Nuclear Science, Vol. 42, No.3, pp. 174-178, 1995
- **E. García-Moreno**, B. Iñiguez, "Radiation effects simulation using and unified MOSFET model", Physica Scripta., Vol. T69, pp. 142-145, 1997
- **E. García-Moreno**, B. Iñiguez, M. Roca, J. Segura and E. Isern, "Clocked dosimeter compatible with digital CMOS technology", Journal of Electronic Testing: Theory and Applications, Vol. 12, pp. 101-110, 1998
- O. Calvo, M. González, M. Roca, **E. García-Moreno**, R. Picos, "Smart Sensor for safety applications on electronic equipment in radiation environment", Latin American Applied Research, Vol. 32, No. 1, pp. 63-67, 2002
- **E. Garcia-Moreno**, R. Picos, E. Isern, M. Roca, S. Bota, K. Suenaga, "Radiation Sensor Compatible with Standard CMOS Technology", IEEE Transactions on Nuclear Science, Vol. 56, No.5, pp. 2910-2915, 2009
- **E. Garcia-Moreno**, E. Isern, M. Roca, R. Picos, J. Font, J. Cesari, A. Pineda, "Floating gate CMOS dosimeter with frequency output", IEEE Transactions on Nuclear Science, Vol. 59, No. 2, pp. 373-378, 2012

- **E. García-Moreno**, B. Iñiguez, M. Roca, J. Segura and S. Sureda, "CMOS radiation sensor with binary output", IEEE Transactions on Nuclear Science, Vol. 42, No.3, pp. 174-178, 1995

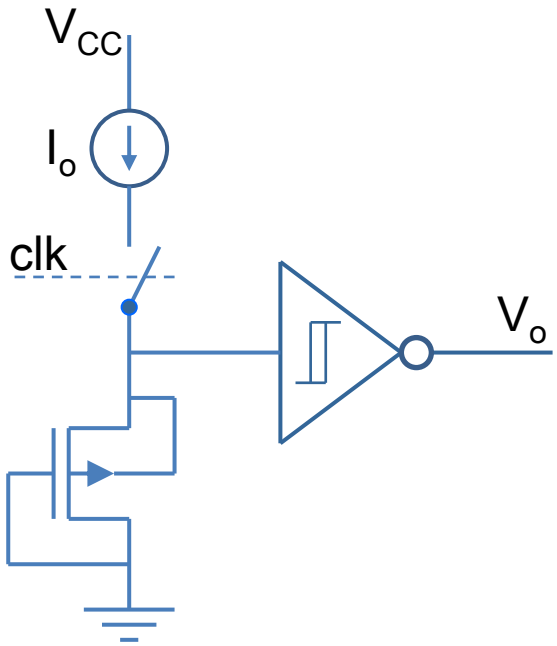


- TID sensor for radiation contingency
- Very simple circuit, compatible with standard CMOS 1.5 μm technology
- Based on the RADFET principle
- The output is a binary signal which changes the state when the TID reaches a threshold
- The threshold can be adjusted, by design, between 0.05-0.25 Mrads

- **E. García-Moreno**, B. Iñiguez, “Radiation effects simulation using and unified MOSFET model”, Physica Scripta., Vol. T69, pp. 142-145, 1997

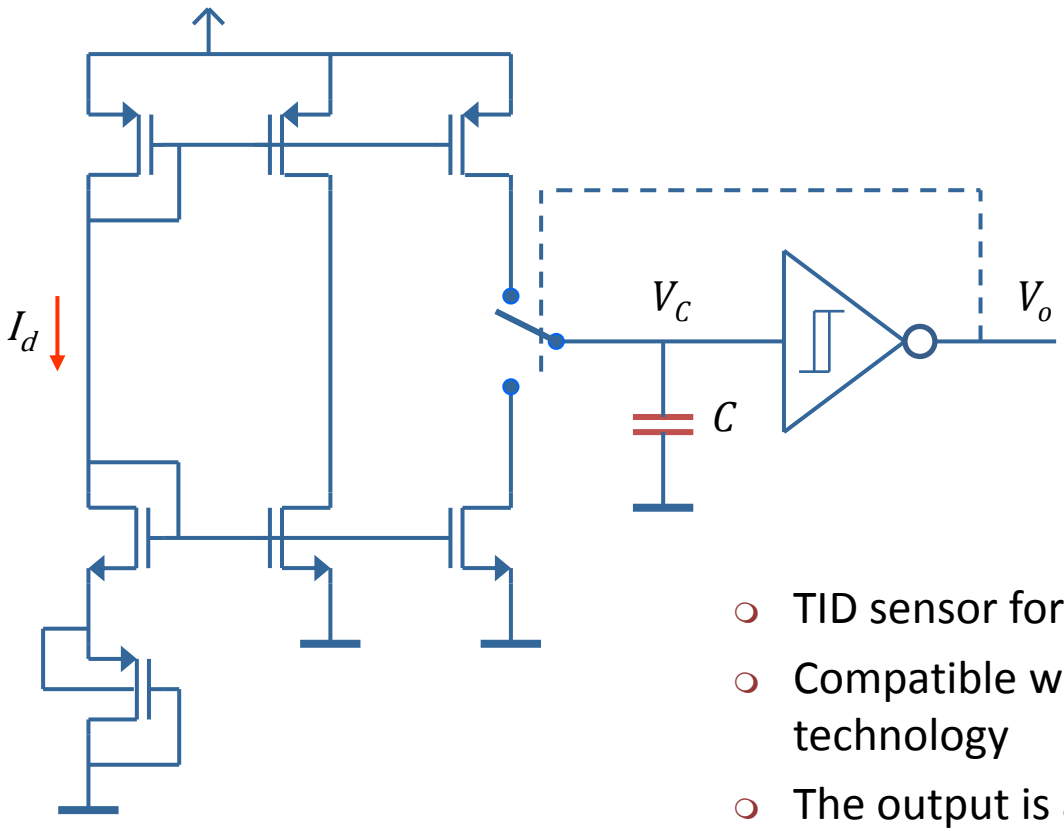
  - The MOSFET model was developed in our group
  - It was an unified model for all the operating regions, like the EKV model
  - The paper shows how to include the TID effects on the device model
  - Only four parameters accounts for the radiation effects
    - Threshold voltage
    - Mobility
    - Mobility degradation coefficient
    - Sub-threshold ideality factor

- **E. Garcia-Moreno**, B. Iñiguez, M. Roca, J. Segura and E. Isern, "Clocked dosimeter compatible with digital CMOS technology", Journal of Electronic Testing: Theory and Applications, Vol. 12, pp. 101-110, 1998
- O. Calvo, M. González, M. Roca, **E. Garcia-Moreno**, R. Picos, "Smart Sensor for safety applications on electronic equipment in radiation environment", Latin American Applied Research, Vol. 32, No. 1, pp. 63-67, 2002



- TID sensor for radiation contingency
- An evolution of the previous sensor
- Simple circuit, compatible with standard CMOS 1.0 μm technology
- The output is a binary signal which changes its state when the TID reaches a threshold.
- It works for a very short time at each clock period, to reduce the power consumption

- **E. Garcia-Moreno**, R. Picos, E. Isern, M. Roca, S. Bota, K. Suenaga, "Radiation Sensor Compatible with Standard CMOS Technology", IEEE Transactions on Nuclear Science, Vol. 56, No.5, pp. 2910-2915, 2009



- Consist of a radiation dependent current source and a current to frequency converter

- TID sensor for radiation contingency
- Compatible with standard CMOS 0.35 μm technology
- The output is a square wave signal whose frequency is proportional to the TID.

- **E. Garcia-Moreno**, E. Isern, M. Roca, R. Picos, J. Font, J. Cesari, A. Pineda, “Floating gate CMOS dosimeter with frequency output”, IEEE Transactions on Nuclear Science, Vol. 59, No. 2, pp. 373-378, 2012

  - This is the subject of the next presentation !!