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fund for scientific research. "

Systematical Method for  
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EFFICIENCY Buildings

POSITIF BUILDIG  
BUILDING +

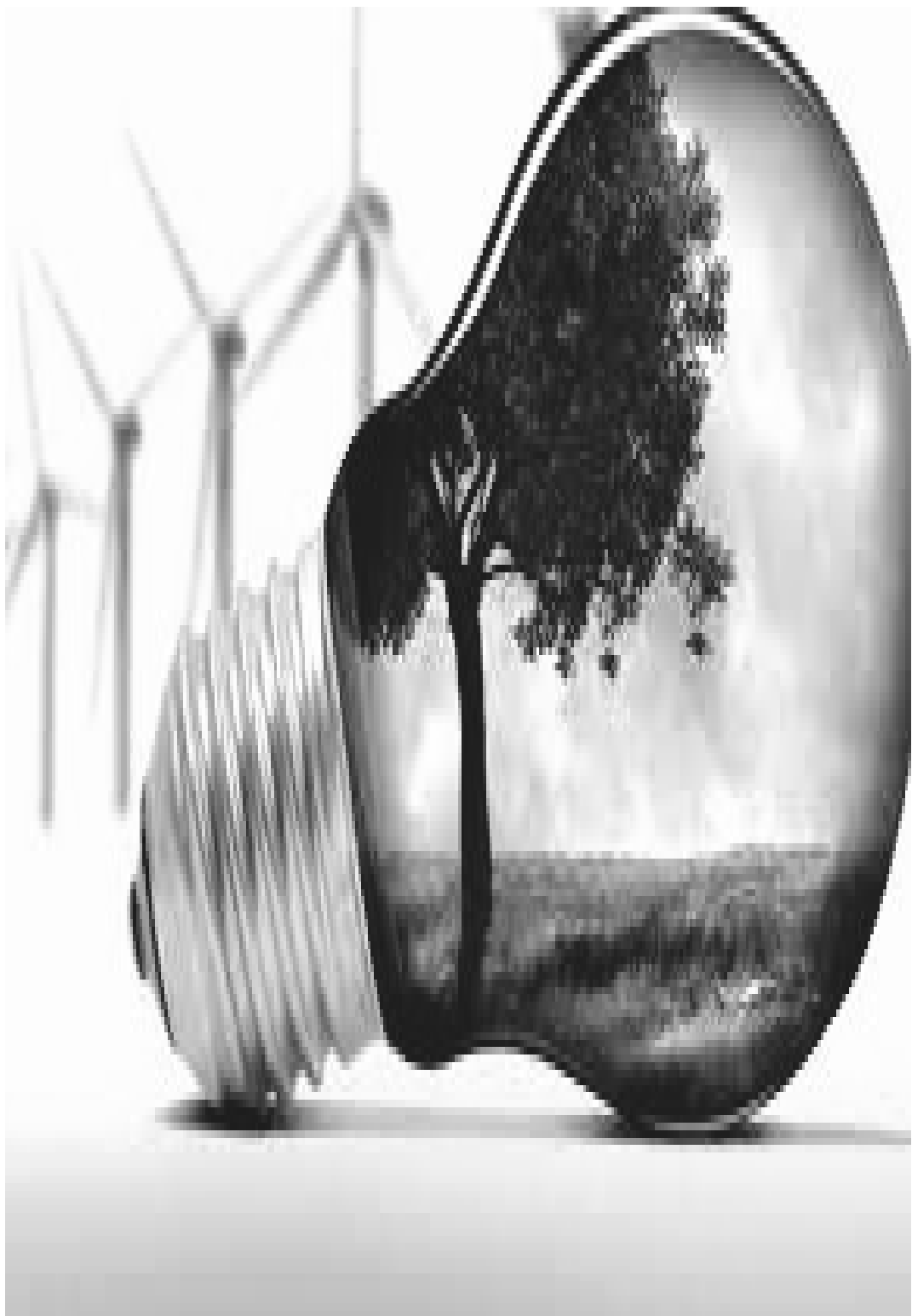
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{Architecture is a wonderful expression of the  
discovery process. It's like a scientist who doesn't  
know the answer, but knows the path to it. That's  
what drives me: the joy of the path, the  
discovery."}

Glenn Murcutt Architect, winner of the 2002  
Pritzker Architecture Prize





***...A My BENACHIR Nouhaila***



## **Dedication**

I dedicate this modest work to my  
dearest parents, the first ones who  
encouraged and supported me during  
this long way.

# Dedication



## **Thanks**

"Praise be to GOD, lord and master of the universes".

I would like to express my thanks to a whole world of people who have made this study possible and who have contributed to its elaboration in any form.

I address myself to GOD, the almighty, to thank him for having given me the courage, the support, the patience to carry out this work.



جامعة الحسن الأول  
UNIVERSITÉ HASSAN 1<sup>ER</sup>



THÈSE PRÉSENTÉE EN VUE DE L'OBTENTION DU  
DIPLOME DE DOCTORAT EN PHYSIQUE  
INGÉNIERIE :

# SCIENCES POUR L'INGÉNIEUR



By: Benachir Nouhaila  
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**Scientific**

**production**

# Publication

## **Publication**

**Benachir Nouhaila (2022). Paper ID APEN-MIT-2022\_7337 JOURNAL Applied Energy Symposium:Journal. Improving the energy performance of the building envelope using phase change materials.**

**Benachir Nouhaila 2022 Paper ID APEN-MIT-2022\_8017 Applied Energy Symposium:Effect of solar ventilation on thermal improvement and energy efficiency of buildings using phase change materials.**

**Benachir Nouhaila Journal of Pharmaceutical Negative Results | Volume 13 | Special Issue 1 | 2022: Role of solar mechanical ventilation and phase change materials on thermal comfort and electrical energy of building envelope.**

**Benachir Nouhaila Benachir , J Nucl Ene Sci Power Generat Technol 2022, 11:9 August 29, 2022, manuscript no. JNPGT-22-73579; Publisher's Date of Assignment: August 31, 2022, pre QC no. JNPGT-22-73579 (PQ); Date of Revision: September 14, 2022, QC no. JNPGT-22-73579; Revision date: September 21, 2022, manuscript no. JNPGT-22-73579 (R); Publication date: September 28, 2022, DOI: 10. 4172/2325-9809.1000292 Nuclear Journal Énergie Science & Pooù Genrestion Ttechnologie.**

**Benachir Nouhaila NGSJ : Volume 10, Issue 6, June 2022 ISSN 2320-9186942 GSJ© 2022.**

**Benachir Nouhaila Maghrebien Journal of Pure and Applied Science e-ISSN : 2458-715X Copyright © 2023, Université Mohammed Premier Oujda Maroc .Maghr. J. Pure & Applied Sci, 2022, Vol. 8, Issue 2, Page 63- 81 <https://revues.imi>.**

**Received November 24, 2022, revised December 12, 2022, accepted December 30, 2022. Benachir et al, Maghr. J. Pure & Appl Sci, 2022, Vol. 8, Issue 2, Page 1-19. CREATING AN ENERGY-EFFICIENT BUILDING ENVELOPE BASED ON PHASE-CHANGE MATERIALS (PCM).**

**Benachir Nouhaila International Journal of Engineering and Applied Physics (IJEAP) Vol. 2, No. 3, September 2022. ISSN : 2737-8071. Simulation of solar mechanical ventilation with phase change materials in building envelope with 2 software TRNSYS and DESIGNBUILDER. Received June 9, 2022 Revised November 20, 2022 Accepted January 11, 2022. Int J Eng & App Phy, Vol. 2, No. 3, September 2022.**

## **International Communications :**

**Benachir Nouhaila** The organizing committee of the 2022 MIT Applied Energy A+B Symposium, which is organized by the International Journal of Applied Energy and the Massachusetts Institute of Technology (MIT)2022. MIT Applied Energy A+B Symposium July 5-8, 2022. Effect of solar ventilation on thermal improvement and energy efficiency of buildings using phase-change materials.

**Benachir Nouhaila (2022)** The organizing committee of the MIT Applied Energy A+B Symposium 2022, which is organized by the International Journal of Applied Energy and the Massachusetts Institute of Technology (MIT)2022. MIT Applied Energy A+B Symposium July 6-8, 2022. Improving the energy performance of building envelopes using phase-change materials.

**Benachir Nouhaila (2021)** Project with Schneider Electric: PAWA PLANT: A PLANT-BASED CELL GREENHOUSE SYSTEM Application of Aloe Vera-derive.

**Benachir Nouhaila (2022 )** 41st World Conference on Applied Science, Engineering and Technology (WCASET 2022) August 24 & 25, 2022. The role of solar mechanical ventilation and phase-change materials on thermal comfort and electrical energy in building envelopes.

**BOOK 41st World Conference on Applied Science, Engineering & Technology (WCASET 2022)** 24th & 25th August 2022. The role of solar mechanical ventilation and phase-change materials on thermal comfort and electrical energy in building envelopes.

**Benachir Nouhaila (2020 )** Fraunhofer-Institut für Bauphysik Standort Holzkirchen. CONFERENCE ON THE TRANSYS PROGRAM.

## **NATIONAL COMMUNICATION**