JANUS COSMOLOGICAL MODEL

TO THE ATTENTION OF THE SPONSORS

June 2, 2022

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Our technology is constantly advancing very fast.

We have cell phones equipped with cameras that give excellent resolution and allow us to make videos. The communication network has become global. We have access to all kinds of information that our predecessors could not even dream of.

We are designing more and more sophisticated robots, in all fields, as well as new materials. Nanotechnology is opening up new areas of technological application.

Our meteorologists have access to daily data on a planetary scale, thanks to a network of observation satellites.

We have sent men to the Moon and robots to Mars. Our telescopes, on the ground and in space, and our radio telescopes operating in networks, allow us to capture data at ever greater distances, involving access to the state of the universe in its most distant past.

We have successfully made the first measurements of gravitational waves.

But :

- Since 1970, the search for the intimate structure of matter has come up against a wall. While from 1890 to 1970 theory and experiment had mutually reinforced each other, after these "glorious eighties" the manna has suddenly dried up.

- Superparticles, the logical extension of the standard model, refused to appear in powerful particle accelerators.

- The cosmological model, based on Einstein's equation, suddenly failed. So that it was necessary to invoke unknown components, grouped under the term dark matter. All attempts to identify it have been failures, for fifty years.

- In 2011, the discovery of the acceleration of the cosmic expansion forced theorists to invoke a mysterious "dark energy", whose nature nobody is able to define.

- To justify the extreme homogeneity of the early universe, discovered in 1988, the action of a field of inflatons, also undefined particles, is invoked.

- For a century, there has been no model to explain the absence of observation of primordial antimatter.

- We have no model of galaxies today. Their dynamics, their formation and evolution patterns remain complete mysteries.

On the basis of these few lines we can only note that the three disciplines of fundamental science that are :

- Cosmology

- Astrophysics

- Theoretical physics

have been experiencing an unprecedented crisis for more than half a century, that specialists try to hide by flooding the public with synthetic images and books, articles, broadcasts where everything is now composed in the conditional tense with "would be ... could ... would explain ... would constitute a model of ... ".

In this context, a new cosmological and theoretical physics model is presented, the Janus Model, which includes concrete and successful developments in all three directions, having been the subject of an uninterrupted series of publications in high-level peer-reviewed scientific journals. This model is based on seventeen observational confirmations.

To summarize, the Janus model introduces, in the universe, components of negative mass (and in theoretical physics of quantum states of negative energy).

The reader will object that such advances have not yet aroused the interest of the specialist community. To this we will reply that this is the fate of any truly innovative and, let us say, revolutionary approach. As an example we will mention geometric algebra, an extension of Clifford's algebra (1845-1879). Developed since the seventies by David Hestenes, Anthony Lasenby, Stephen Gull, Chris Doran, it proves its remarkable efficiency as a new universal language of physics, but it is only just beginning to reach the community of theorists, fifty years after the first works in this field. However, this simple and efficient language, allowing to build bridges between disciplines considered as foreign until now, will soon impose itself by implying a complete rewriting of all theoretical constructions of physics.

A didactic presentation can be found in the forty "Janus" videos, as well as a summarized presentation in the video Janus 29, of one hour and forty minutes.

We will only recall the observational confirmations of the model :

1: The model fits with local relativistic observations: Mercury perihelion advance, gravitational lensing effect due to the Sun. [7], [9], [13]

2 : It solves the paradox of the non-observation of primordial antimatter, invisible, because it has a negative mass [9].

3 : It is the only one to give a precise nature to the invisible components of the universe. These are antiprotons, antielectrons and anti neutrons of negative mass. [9]

4: It explains the homogeneity of the early universe, which is an alternative to the inflation model. [5], [7]

5 : It accounts for the fluctuations in this CMB [14]

6: It perfectly accounts for the observational data referring to the acceleration of the cosmic expansion. [13]

7: It explains the lacunar structure of the visible part of the universe, at very large scale. [7], [8]

8 - It is the only one to provide the explanation of the phenomenon of the "dipole repeller" as a vast empty area, pushing back the galaxies, at 600 million light-years distance. It is a spheroidal conglomerate of antimatter of negative mass. [7]

9 - It accounts for gravitational lensing effects in the vicinity of galaxies, attributed to dark matter. [7]

10 - It accounts for the flat shape of the rotation curves of galaxies, in the periphery. [7]

11 - It accounts for the phenomena of gravitational mirages in the vicinity of galaxy clusters. [7]

12 - It accounts for the spiral shape of galaxies. [8]

13 – It accounts for the image of the object located at the center of M-87. It is not a "giant black hole" but a "plugstar", an alternative model to black holes.

14 – It explains why galaxies with high redshift have low magnitudes. [9]

15 – It solves the question of the "pre-Big Bang": at this point, time reverses. [1], [2]

16 – It extends quantum mechanics by giving a sense to negative energy states from the Dirac and Schödinger equations. [15], [17]

17 - The model makes interstellar travel not impossible [10].

The research process, in this "Janus" framework, requires very particular scientific and human skills. Indeed it is not less than to raise oneself to the level of the founding fathers of modern science: Dirac, Schrödinger, Bohr, Einstein and all the others. It is therefore not a question of making calculations based on old material, but of renewing it. Thus, in cosmology and astrophysics, it has been necessary to replace Einstein's equation by a system of coupled field equations:

$$R_{\mu\nu} - \tfrac{1}{2} R\, g_{\mu\nu} - \Lambda g_{\mu\nu} = \chi\, T_{\mu\nu}$$

$$\rightarrow$$

$$R^{(+)}_{\mu\nu} - \tfrac{1}{2} R^{(+)} g^{(+)}_{\mu\nu} = \chi \left[T^{(+)}_{\mu\nu} + \sqrt{\frac{g^{(-)}}{g^{(+)}}}\, \widehat{T}^{(-)}_{\mu\nu} \right]$$

$$R^{(-)}_{\mu\nu} - \tfrac{1}{2} R^{(-)} g^{(-)}_{\mu\nu} = -\chi \left[\sqrt{\frac{g^{(+)}}{g^{(-)}}}\, \widehat{T}^{(+)}_{\mu\nu} + T^{(-)}_{\mu\nu} \right]$$

We can therefore only entrust this work to scientists

who are finders and not researchers.

Only the Belgian mathematician Nathalie Debergh has shown over the last five years that she meets these criteria [15], [17]. We therefore solicited donations in 2021 to allow her to devote herself half-time to this research for two years. This operation represented a total of 100,000 dollars. This collection was done via a non-profit association Support Janus, which is able to manage any financial contribution, private or institutional. Mrs. Debergh's approach is a complete rewriting of quantum mechanics through geometric algebra.

Recently (2022 may 30) Nathalie Debergh has sent for publication a recent work where, using this branch of mathematics that is the Geometric Algebra :

https://en.wikipedia.org/wiki/Geometric_algebra

she has just created, in quantum mechanics, the equivalent of the equations of the Janus Model in cosmology (see above) .

The mathematician David Hestenes had translated the Dirac equation using the formalism of geometric algebra, which had given the Dirac Hestenes equation.

http://www.jp-petit.org/papers/mathematical-physics/2022-Debergh-Petit-On-spacetime-algebra-and-its-relations--with-negative-masses.pdf

Nathalie Debergh, managing both positive and negative masses, produced this time :

5 The Dirac-Hestenes equation with positive and negative masses

We owe it to Hestenes to have proposed the counterpart of the Dirac equation in the context of geometric algebra. This (real) equation is

$$\gamma_\mu \left(\partial_\mu \phi \, \gamma_2 \gamma_1 - e \, A_\mu \, \phi\right) = m \, \phi \, \gamma_0 \tag{44}$$

It can also be proposed on the form

$$\begin{cases} -i\Delta \, \widehat{\Phi} \, \sigma_3 + e \, A \, \widehat{\Phi} + m \, \Phi = 0 \\ -i\widehat{\Delta} \, \Phi \, \sigma_3 + e \, \widehat{A} \, \Phi + m \, \widehat{\Phi} = 0 \end{cases} \tag{45}$$

with $\phi = \begin{pmatrix} \Phi & 0 \\ 0 & \widehat{\Phi} \end{pmatrix}$.

It is then usually said that the whole Dirac formalism is contained in the first 2 by 2 equation of (45) as the second one is simply its conjugate in the sense $\sigma_j \to -\sigma_j$.

Hestenes' demonstration of his equation is as follows: he proposed to consider a bispineur $|u>$ such that

As mentioned in the article, the matter-antimatter symmetry is also present in the world of negative masses . Thus this system of equations gives rise to four types of masses. Negative mass antimatter is precisely this primordial antimatter which has been the great absentee of cosmology for nearly a century. It escapes observation since negative mass particles emit photons of negative energy, which our eyes and instruments cannot capture.

The electromagnetic field has been quantified for a long time, giving rise to a go-between that is the photon. But this is only possible because positive and negative charges are managed simultaneously. We believe that the failure of the quantization of the gravitational field for decades is linked to the fact that we only manage particles of positive mass.

Nathalie Debergh will now try to concretize the quantization of gravitation by starting again from these new bases consisting in integrating the negative masses in this construction.

What needs to be done to develop this research?

At this point, there are only two possible avenues:

- To ensure that Ms. Debergh can continue her research.

- Incentivize, in the form of bonuses, already confirmed scientists to contribute to this Janus enterprise by publishing work in specialized journals at the highest level (Nature, Physical Review D, Physical Letters, etc)

Our principle is to provide material support only to scientists

who have demonstrated a real capacity for innovation, at the highest level.

This is a long term research, of maximum ambition. It is nothing less than to rebuild cosmology, astrophysics and quantum mechanics on new foundations. To collaborate effectively in such an undertaking, scientists need to be able to devote themselves to it full-time with job security.

Universities in all countries and in France the CNRS respond to this question by providing researchers with permanent positions, giving them a civil servant status. But this system has only one flaw: recruitment is entrusted to the people already in place, who then define a profile and advocate integration into teams that have already been formed.

However, these teams have largely demonstrated, in half a century, their sterility, as well as the sterility based on the research themes they recommend and, consequently, the inadequacy of the profiles through which the selection of candidates is made. In all countries, in theoretical research units, full-time researchers are paid for decades to find nothing, and accumulate theses and publications that are only worth their weight in paper.

This situation has its counterpart in the French Academy of Sciences, in the specialties concerned. One of the academicians, working in particle physics, was admitted on the basis of his work on the "photino", a supersymmetric particle that has never been observed. In another field, his theoretical work on galactic dynamics is completely inconsistent. Finally, another academician centers his cosmology work on a mathematically incoherent model. All of them have obviously been rewarded by many prizes, for their non works.

Nathalie Debergh , mathematician, holder of a doctoral thesis and having to her credit more than one hundred publications in high level journals, judged too independent, could not find a place in the Belgian university and had to fall back on a teaching position in a technical school where, which represents a total waste of skills.

She has in 2018 and 2022, through two important publications in high level, peer-reviewed journals, demonstrated her qualities as a finder [15], [17]. Her current work is a reformulation of quantum mechanics through geometric algebra.

The most obvious and urgent measure should be her integration in the Belgian university, on a research position, unless the French Cnrs welcomes her in its midst. But in the present context, this is only a wishful thinking. Thanks to private donations (100,000 dollars), we have obtained from her employer that she can be put on availability half-time for two years, her complementary salary being paid to her by the association Support Janus. But her status does not allow her to be available full-time, which would obviously have been desirable. It is not certain that this availability can be extended beyond 2023. She cannot, of course, give up the security that her status as a civil servant confers on her. For this to be feasible, a sponsorship operation would have to ensure her a permanent job during the 11 years that separate her from her

retirement, which represents an envelope amounting to two million euros (including charges).

For the sake of completeness, we will mention the recent publication of the Canadian Benoit Guay[1] (62 years old), made in 2022 in the high level journal Modern Physics Letters A [18] which, through the quantum theory of fields, is part of this process of introducing negative energy states into theoretical physics and thus represents a new stone brought to the model. Like Nathalie Debergh[2], he could not find a place in the Canadian authorities of theoretical research and assures his subsistence by occupying the function of guardian of a group of buildings. As an incentive, the Janus Support Association has, within its very modest means, paid him a bonus of 2000 dollars in 2022. It is up to the Canadian Government to ask itself how a researcher engaged in promising research, who places his work in one of the most highly rated journals in the discipline, was obliged to get a job as a janitor in order to live.

Personally, being retired, I will be able to continue this research by ensuring by myself the archiving of all the works, without any purse, through a book in the course of drafting, which will be placed at the disposal free of charge on Internet via my site " Savoir-sans-Frontières ", with translations in several languages. For me, the central problem is not my material situation, but my life expectancy. Born in 1937, at the time I am writing these lines I am 85 years old.

Conclusion :

This file, intended for candidate-sponsors, is not very optimistic and is more informative than anything else. Financially, it could be summarized as follows:

We need two million euros to allow Nathalie Debergh
to work full time on our research, in good conditions.

For one may be skeptical that France, Belgium, or even a European country, realizes the chance to occupy a leading position in the field of global theoretical research: in all countries, the assignment of a research position to a 56 year old candidate has little chance of being considered.

The Janus model is currently, with its 17 observational confirmations, the only alternative to get out of the crisis that cosmology, astrophysics and theoretical physics have been experiencing for more than half a century. But the media (written press or television) show a guilty silence in front of the results already obtained. A sponsoring action could thus be centered on the purchase of pages in the written press or airtime on television (particularly in the United States).

Finally, this sponsoring could concern the proposal of bonuses to confirmed scientists who manage to publish work within the framework of the Janus model, in the highest level journals, true sanctuaries of official science: Nature, Physical Review D, Physical Letters, Monthly Notices, etc.

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[1] Benoit.guay@manaty.net . Born in 1960.
[2] nathalie.debergh@hech.be Born in 1966.

Références :

[1] **1977** : J. P. Petit, Univers Enantiomorphes à flèches du temps opposées, Compte Rendus de l'Académie des Sciences de Paris du du 8 mai **285**, pp. 1217–122

http://www.jp-petit.org/papers/CRAS/cosmology_1977a.pdf

→ *Enantiomorphic universes with opposite arrows of time.*

First draft, Newtonian and non-relativistic, of the Janus model

[2] **1977** : J. P. Petit, Univers en interaction avec leur image dans le miroir du temps, Compte Rendus de l'Académie des Sciences de Paris du 6 juin, t. 284, série A, pp. 1413–1416, présenté par le mathématicien André Lichnérowicz.

http://www.jp-petit.org/papers/CRAS/cosmology_1977b.pdf

→ *Universes interacting with heir image in the time mirror*

Continuation of the previous note. Reflection on the inversion of the time coordinate.

[3] **1978** : J.P.Petit : le retournement non trivial du tore. CRAS t.287 (20 nov).

http://www.jp-petit.org/papers/CRAS/geometry_1978d.pdf

And http://www.jp-petit.org/papers/pls-jan79.pdf

http://www.savoir-sans-frontieres.com/JPP/telechargeables/Francais/LE%20TOPOLOGICON.pdf

A second non trivial eversion of the torus.

Mathematical prelude (topology) to the topological support of the Janus model.

[4] **1981** : J.P.Petit : Une représentation analytique de la surface de Boy. Compte Rendus de l'Académie des Sciences de Paris t. 293 (5 oct.).

http://www.jp-petit.org/papers/CRAS/geometry_1981.pdf.

The first analytic set of equations to figure the Boy surface.

[5] **1988** : J.P.PETIT : Cosmological model with variable velocity of light. Modern Phys Letters A3, pp. 1527.

http://www.jp-petit.org/papers/cosmo/1988-ModPhysLettA-1.pdf

Challengin g the inflation model.

[6] 1994 : J. P. Petit, Nuovo Cimento B. The missing mass problem. **109**, 697.

First draft of the Janus Cosmological Model. .

[7] **1995 :** J.P.PETIT, Twin Universe Cosmology, Astrophys. and Sp. Science, **226**, 273-307.

http://www.jp-petit.org/papers/cosmo/1995-AstrophysSpaceSci.pdf

Introducin negative lensing effect.

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http://www.jp-petit.org/papers/cosmo/2001-where-is-the-matter.pdf

The second matter, with negative mass, corresponds to the extension of the restricted Poincaré group to the entier group, incliding negative energies. Introducing joint gravitational instabilities. Spiral structure : results.

[9] **2014** : J.P.Petit, G.D'Agostini : Negative Mass hypothesis in cosmology and the nature of dark energy. Astrophysics And Space Sccience,. *A* **29**, 145-182.
http://www.jp-petit.org/papers/cosmo/2014-AstrophysSpaceSci.pdf

First model described by two interacting field equations. The negative species drives the acceleration of the cosmic expansion.

[10] **2014** : J.P.Petit, G.D'Agostini : Cosmological Bimetric model with interacting positive and negative masses and two different speeds of light, in agreement with the observed acceleration of the Universe. Modern Physics Letters A, Vol.29 ; N° 34 ; Nov 10th.
http://www.jp-petit.org/papers/cosmo/2014-ModPhysLettA.pdf

The Janus Cosmological Model with two different speeds of light.

[11] **2015** : J.P.Petit & G.D'Agostini : Cancellation of the singularity of the Schwarzschild solution with natural mass inversion process. Mod. Phys. Lett. A vol. 30 n°9 23 mars.

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[12] **2015** : J.P.Petit & G.D'Agostini : Lagrangian derivation of the two coupled field equations in the Janus Cosmological Model. Astrophysics and Space Science, 357 :67

http://www.jp-petit.org/papers/cosmo/2015-AstroPhysSpaceSci.pdf

[13] **2018** : G.DAgostini and J.P.Petit : Constraints on Janus Cosmological model from recent observations of supernovae type Ia, Astrophysics and Space Science pp 363:139.

http://www.jp-petit.org/papers/cosmo/2018-AstrophysSpaceSci.pdf.

[14] **2018** : J.P.Petit The Janus Cosmological Model and the Fluctuations of CMB. Progress in Physics vol. 14 issue 4

http://www.jp-petit.org/papers/cosmo/2018-Progress-in-Physics.pdf

[15] **2018.** N.Debergh, J.P.Petit and G.D'Agostini : Evidence of negative energies and masses in the Dirac equation through a unitary time-reversal operator. , J. Phys. Comm. **2**
http://www.jp-petit.org/papers/quantum-mechanics/2018-journal-of-physics-MQ.pdf

The Dirac equation's negative energy states can be considered valuably.

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http://www.jp-petit.org/papers/cosmo/2019-Progress-in-Physics-1.pdf

[17] **2022** : N.Debergh , J.P.Petit : On some reasons why the the reversal operator could be unitary. Phys. Lett A 442.

http://www.jp-petit.org/papers/quantum-mechanics/2022-Nathalie-PhysLettA.pdf

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http://www.jp-petit.org/papers/quantum-mechanics/2022-ModPhysLettA-Guay.pdf

Method for generating and detecting negative mass and energy particles in the laboratory.

Videos :

- Forty videos representing a presentation of the Janus cosmological model : In french. Most of them have english subtitles.

http://www.jp-petit.org/nouv_f/VIDEOS_JANUS.htm

- Contents :

http://www.jp-petit.org/janus/Janus_contents.pdf

- **In english** : Synthesis of the presentation of the Janus cosmology model (one hour and forty minutes):

https://www.youtube.com/watch?v=RXKONGBClY0

In french : The plugstar model, alternative to the black hole model (1 h 20):

https ://www.youtube.com/watch?v=dqeOWRzohr0

- **In french** , Its long version, for " minimum graduate maths level " (5 h 20) :

https://www.youtube.com/watch?v=RKmxVKINk8A

NATHALIE DEBERGH

PROFESSIONAL EXPERIENCE

F.N.R.S. RESEARCHER, THEORETICAL AND MATHEMATICAL PHYSICS

University of Liège, 16/09/1990-30/09/2002

REGION WALLONNE RESEARCHER, PHOTOMETRY

Université of Liège, 01/10/2002-31/03/2007

MATHEMATICS TEACHER

Athénée Royal de Huy, 03/09/2007-30/06/2008

MAITRE-ASSISTANT EN SCIENCES MATHEMATIQUES

Haute Ecole Charlemagne, 15/09/2008-titularisation le 1er septembre 2018

EDUCATION

LICENCE EN SCIENCES MATHEMATIQUES

Université of Liège, 1988, Grande Distinction

DOCTORAT EN SCIENCES MATHEMATIQUES

Université of Liège, 1993, Plus Grande Distinction avec Félicitations du Jury

AGREGATION DE L'ENSEIGNEMENT SUPERIEUR EN SCIENCES

Université of Liège, 1999

- ✓ Consulate English Award (1984)
- ✓ Winner of the Travelling Scholarship Competition (1993)

- ✓ 105 articles published in international peer-reviewed journals (Journal of Mathematical Physics, Modern Physics Letters A, Journal of Physics A, Physical Review D, Nuclear Physics B, Helvetica Physica Acta, Zeitschrift fur Physik C, Physics Letters A, Physics Letters B, International Journal of Modern Physics A, Fortschritte der Physik, International Journal of Theoretical Physics, Journal of Nonlinear Mathematical Physics, Annals of Physics, Lighting Research and Technology, Journal of Physics Communication)
- ✓ Referee for 9 international journals
- ✓ Research stays in
  - Palaiseau, Ecole Polytechnique (Professor A. Chakrabarti)
  - Bloomington, Indiana University (Professor A. Kostelecky)
  - Kiev, Académie des Sciences (Professor A.G. Nikitin)
  - Prague, Académie des Sciences (Professor A.G. Nikitin)
- ✓ Participation in conferences with oral presentation (Corsica, Marocco, Germany, U.S.A., Spain, U.K., Mexico,

Japan, Israël, India)

PUBLICATIONS

INTERNATIONAL JOURNALS

1) *On generalized coherent states with maximal symmetry for the harmonic oscillator*
   J. Beckers and N. Debergh
   Journal of Mathematical Physics **30** (1989) 1732-1738
2) *On parasupersymmetric coherent states*
   J. Beckers and N. Debergh
   Modern Physics Letters **A4** (1989) 1209-1215
3) *Coherent states in parasupersymmetric quantum mechanics*
   J. Beckers and N. Debergh
   Modern Physics Letters **A4** (1989) 2289-2293
4) *On k=3/4 coherent states for the harmonic oscillator*
   N. Debergh
   Journal of Physics **A23** (1990) 147-152
5) *Parastatistics, supersymmetry and parasupercoherent states*
   J. Beckers and N. Debergh
   Journal of Mathematical Physics **31** (1990) 1513-1523
6) *On the Lie extended method in quantum physics and its supersymmetric version*
   J. Beckers and N. Debergh
   Journal of Physics **A23** (1990) Letter to the Editor, L353-L357
7) *On unitary Lie superalgebras form the spin-orbit supersymmetrization procedure*
   J. Beckers, N. Debergh, V. Hussin and A. Sciarrino
   Journal of Physics **A23** (1990) 3647-3659
8) *Supersymmetry, Foldy-Wouthuysen transformations and relativistic oscillators*
   J. Beckers and N. Debergh
   Physical Review **D42** (1990) 1255-1259
9) *Parastatistics and supersymmetry in quantum mechanics*
   J. Beckers and N. Debergh
   Nuclear Physics **B340** (1990) 767-776
10) *On parasupersymmetry and remarkable Lie structures*
    J. Beckers and N. Debergh
    Journal of Physics **A23** (1990), Letter to the Editor, L751S-L755S
11) *A note on recent Lie parasuperstructures*
    J. Beckers and N. Debergh
    Journal of Physics **A23** (1990), Letter to the Editor, L1073-L1077
12) *N=2-extended supersymmetries and Clifford algebras*
    J. Beckers and N. Debergh
    Helvetica Physica Acta **64** (1991) 24-47
13) *On the harmonic oscillator and its invariance superalgebras*
    N. Debergh
    Journal of Physics **A24** (1991) 147-151
14) *Lie structures in parasupersymmetric quantum mechanics : I the standard supersymmetrization procedure*
    J. Beckers and N. Debergh

Journal of Mathematical Physics **32** (1991) 1808-1814
15) *Lie structures in parasupersymmetric quantum mechanics : II the spin-orbit coupling supersymmetrization procedure*
J. Beckers and N. Debergh
Journal of Mathematical Physics **32** (1991) 1815-1821
16) *On partner potentials in parasupersymmetric quantum mechanics*
J. Beckers and N. Debergh
Zeitschrift fur physic **C51** (Particles and Fields) (1991) 519-524
17) *On the symmetries of relativistic spin one-half particle equations*
J. Beckers and N. Debergh
Journal of Physics **A24** (1991) 2889-2901
18) *On color superalgebras in parasupersymmetric quantum mechanics*
J. Beckers and N. Debergh
Journal of Physics **A24** (1991), Letter to the Editor, L597-L603
19) *On supersymmetric harmonic oscillators and Green-Cusson's ansatze*
J. Beckers and N. Debergh
Journal of Mathematical Physics **32** (1991) 3094-3100
20) *On Clifford algebras and unitary Lie superalgebras*
N. Debergh
Journal of Physics **A24** (1991) 4715-4720
21) *More on the symmetries of the Schrödinger equation*
J. Beckers, N. Debergh and A.G. Nikitin
Journal of Physics **A24** (1991), Letter to the Editor, L1269-L1275
22) *On a general framework for q-particles, paraparticles and q-paraparticles through deformations*
J. Beckers and N. Debergh
Journal of Physics **A24** (1991), Letter to the Editor, L1277-L1283
23) *Parasupercoherent states and color supergroups*
N. Debergh
Journal of Mathematical Physics **33** (1992) 394-398
24) *On supersymmetries in nonrelativistic quantum mechanics*
J. Beckers, N. Debergh and A.G. Nikitin
Journal of Mathematical Physics **33** (1992) 152-160
25) *Extended Dirac symmetries and hidden supersymmetry*
J. Beckers, N. Debergh and A.G. Nikitin
Physics Letters **B279** (1992) 333-335
26) *More on supersymmetries of the Schrödinger equation*
J. Beckers, N. Debergh and A.G. Nikitin
Modern Physics Letters **A7** (1992) 1609-1616
27) *From N=2 supersymmetry to quantum deformations*
J. Beckers and N. Debergh
Physics Letters **B286** (1992) 290-292
28) *On pararelativistic quantum oscillators*
J. Beckers, N. Debergh and A.G. Nikitin
Journal of Mathematical Physics **33** (1992) 3387-3392
29) *Lie extended symmetries and relativistic particles*
J. Beckers, N. Debergh and A.G. Nikitin
Journal of Physics **A25** (1992) 6145-6154

30) *On relativistic scalar and vector mesons with harmonic oscillatorlike interactions*
N. Debergh, J. Ndimubandi and D. Strivay
Zeitschrift fur physic **C56** (Particles and Fields) (1992) 421-425
31) *More on parasupersymmetries of the Schrödinger equation*
J. Beckers, N. Debergh and A.G. Nikitin
Modern Physics Letters **A8** (1993) 435-444
32) *Positive discrete series of osp(2/2,R) and (para)supersymmetric quantum mechanics*
N. Debergh
Journal of Mathematical Physics **34** (1993) 1270-1276
33) *A note on genon and parastatistics*
N. Debergh
Modern Physics Letters **A8** (1993) 765-769
34) *On a family of supersymmetrization procedures*
J. Beckers and N. Debergh
Journal of Mathematical Physics **34** (1993) 3378-3390
35) *On a parastatistical hydrogen atom and its supersymmetric properties*
J. Beckers and N. Debergh
Physics Letters **A178** (1993) 43-46
36) *On quantum deformations of the simplest Lie parasuperalgebra*
J. Beckers and N. Debergh
Journal of Physics **A26** (1993) 4311-4318
37) *Poincaré invariance and quantum parasuperfields*
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2) *Coherent states and parasupersymmetric quantum mechanics*
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2) *Parasuperspectre de l’énergie en mécanique quantique*
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3) *Hadronic spectroscopy, supersymmetry and relativistic harmonic oscillators*
Réunion scientifique générale de la société belge de physique (01-06-1990, Louvain-la-Neuve)
4) The supersymmetric version of the Lie extended method in quantum mechanics
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5) *Coherent states and parasupersymmetric quantum mechanics*
Workshop “squeezed states and uncertainty relations” (29-03-1991, Baltimore)
6) *On coherent states and Lie parasuperalgebras*
Invitation personnelle, Prof. R. Gilmore (02-04-1991, Philadelphie)
7) *On generalized Lie algebras and parastatistics*
Invitation personnelle, Prof. B. Kolman (03-04-1991, Philadelphie)
8) *Parabosonic coherent states from color groups*
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9) *On supersymmetry and paraparticles*
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15) *Parasupersymmetry and relativistic quantum mechanics*
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24) *Generalized deformations : some consequences in supersymmetric quantum mechanics*
Groupe de contact de physique mathématique du FNRS (27-10-1995, Mons)
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Invitation personnelle (plenary speaker), International conference on 70 years of quantum mechanics and recent trends in theoretical physics (31-01-1996, Calcutta)

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29) *Hamiltoniens non-hermitiens : quelques implications en mécanique quantique*
Invitation personnelle, Profs. Y. Brihaye et J. Nuyts (13-01-2000, Mons)
30) *Déformations polynomiales d'algèbres de Lie : quelques implications en physique quantique*
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31) *On quasi-exact solvability of quantum optical models and polynomial deformations of sl(2,R)*
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32) *Quasi-exactly solvable Schrödinger equations with or without group theory*
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