POLITECNICO DI TORINO
Repository ISTITUZIONALE

Preface: A biographical note on prof. Gaetano Giaquinta, a mentor and a friend

Original
Preface: A biographical note on prof. Gaetano Giaquinta, a mentor and a friend / Grillo, Alfio; Federico, Salvatore. - In: ATTI DELLA ACCADEMIA PELORITANA DEI PERICOLANTI, CLASSE DI SCIENZE FISICHE, MATEMATICHE E NATURALI. - ISSN 1825-1242. - ELETTRONICO. - 96:Suppl.1(2018). [10.1478/AAPP.96S1E2]

Availability:
This version is available at: 11583/2723264 since: 2023-06-26T15:38:03Z

Publisher:
Accademia Peloritana dei Pericolanti.

Published
DOI:10.1478/AAPP.96S1E2

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

20 September 2024

DOI: 10.1478/AAPP.96S1E2

AAPP | Atti della Accademia Peloritana dei Pericolanti
Classe di Scienze Fisiche, Matematiche e Naturali
ISSN 1825-1242

Vol. 96, No. S1, E2 (2018)

PREFACE: A BIOGRAPHICAL NOTE ON PROF. GAETANO GIAQUINTA, A MENTOR AND A FRIEND

ALFIO GRILLO[a*] AND SALVATORE FEDERICO[b]

ABSTRACT. We provide some biographical information about Prof. Gaetano Giaquinta, who passed away on the 13th of August 2016, after a long disease. Prof. Gaetano Giaquinta was for us a mentor, a guide, and ultimately a friend. His words have assisted us not only along our scientific and academic path – as students first and as professors afterwards – but also in our everyday lives. His teachings are a reference, to which we still confidently turn, when we need solace or advise.

1. Introduction

There was a sentence that Prof. Gaetano Giaquinta (28th of November 1945 – 13th of August 2016) used to say when somebody asked him about death. He answered:

"Death is the eigenstate of the operator «Life» with eigenvalue zero."

He had a rather calm mind when he gave this statement. Still one could perceive a touch of "rational" melancholy in it: what made him sad was not the fear of leaving this world, but the awareness that he would have been "released from the commitment" of cherishing his beloved ones and educating his students.

Gaetano Giaquinta was a man who professed Physics in every action he did and in every word he spoke. He was an aesthete, a man capable of recognising beauty in a theorem, in a painting, or in a poem. Science, for him, had to be elegant, and so were his lectures: Symmetries, Noether's Theorem, Maxwell's Equations and Gauge Theories were the pillars of his doctrine, which he transmitted to us with passion and love during his classes of Lagrangian and Hamiltonian Mechanics, Electromagnetism, Relativity, Quantum Mechanics, Structure of Matter and Solid State Physics.

Gaetano Giaquinta graduated in Physics at the University of Catania, Italy, on the 20th of November 1968. His thesis, whose title in English would be "*Josephson Currents in Superconducting Junctions with a non-Conventional Insulator*" (Giaquinta 1968), was the first work on superconductivity at the University of Catania (Federico and Grillo 2018). Then, from 1969 to 2013, he served the scientific community as a theoretical physicist, with various and rich contributions, these ranging from the foundations of Quantum Mechanics

to the Theory of Phase Transitions, from Solid State Physics to Electromagnetism and Continuum Mechanics. He wrote journal articles and monographs, and held lectures and seminars in conferences and specialisation schools.

The scientific interests of Gaetano Giaquinta were very diverse, and have changed through the years. A list of his principal research fields has been recently reported by Federico and Grillo (2018) in a special issue of *Mathematics and Mechanics of Solids* dedicated to him. His profound comprehension of things – be these natural phenomena or social facts, expressions of art, or theological questions – made his approach to science (and to people) very philosophical. This was in fact a benefit for the people around him, even though the subtleties of his thoughts were sometimes too fine to be caught, especially by students.

Gaetano Giaquinta became Professor of Physics in 1971 and, since then, he *professed*[1] Physics at the Faculty of Medicine and Surgery, at the Faculty of Mathematical, Physical and Natural Sciences, and at the Faculty of Engineering. The latter, perhaps, was the one to which he was most attached. Any time he went to a class, or to a meeting with his colleagues, one could see him walk around the Faculty of Engineering carrying under his arm one of the books he loved the most: All generations of his students will surely remember *Mechanics* (Landau and Lifshitz 1969), *The Classical Theory of Fields* (Landau and Lifshitz 1971), and *Geometry, Particles, and Fields* (Felsager 1989). As soon as students saw him, they gathered around him, wishing him a nice day or simply asking *"How are you, Prof. Giaquinta?"*. Few words about *any* subject raised by his students were enough to have him commencing a "lecture on the fly" about the connection of that subject with Physics, no matter how far from Physics that subject was.

Prof. Gaetano Giaquinta's love for students and, above all, for being in the position of conveying his thoughts to them, was perhaps his strongest motivation to profess Physics at the University, even when his health was so seriously compromised that he could barely stand. Indeed, despite his poor health conditions, he continued to talk and to listen to his students, inspiring them the necessary courage for keeping alive in Engineering and, more generally, in everyday life.

Prof. Giaquinta's classes were, first of all, cultural events. He spoke of the Fall of the Roman Empire as a topological fact; he merged Kant's thought with Hamilton's Principle of Stationary Action, and he interpreted Theology in terms of broken symmetries and their dynamic restoring. When he realised that he would have no longer held courses in his University, he said:

> *"I'll rather take a bench, sit in the courtyard of Engineering and tell about Lagrangian Mechanics to anybody who wants to listen to me!"*

In the last years of his journey on this Earth, he served the Scientific Community, and in particular his younger colleagues, as a member of the *Accademia Peloritana dei Pericolanti*[2] (Messina, Italy) and as the President of the Scientific Committee of the *Fondazione Floresta-Longo* (Catania, Italy).

[1] Prof. Giaquinta used to say: *"I do not teach Physics. I* profess *Physics"*.

[2] http://www.accademiapeloritana.it/

2. The crossover of our lives with Prof. Giaquinta

It all began in a classroom of the Faculty of Engineering, academic year 1996-1997, waiting for the first class of Physics II. There were about a hundred students. A man was standing close to the classroom's door, holding an extinguished cigarette in his right hand and an empty cup of coffee in his left hand. He was in a "cloud" of students, telling them a funny anecdote about Newton and his *Principia* (Newton 1687). His hair and beard were white but, although he looked much older than he actually was, there was something young in the way he laughed and spoke. Then, the man took his leave from those students and entered the classroom. He had a captivating smile and vivid, intelligent eyes: It was Prof. Gaetano Giaquinta. He took off his jacket, and, after introducing himself, he told about how his classes would be. His speech was tortuous, but fascinating, enriched by stories of any kind. Among his unforgettable statements, we quote here what he said about "standard" books of Physics:

> *"When you open a book, never start reading it from the Introduction! Start with the Conclusion and, only after you're done with it, go back to Introduction and see whether the Author has been consistent with the promises made."*

The whole course followed this philosophy and, in fact, Prof. Giaquinta was consistent with what he had promised: Bearing in mind the motto *"Physics – Where the action is"* (Watson 1986), he led us into the world of Analytical Mechanics of D'Alembert, Lagrange, Poisson, and Hamilton. Then, he turned to Electromagnetics and, adhering to Hertz's statement, *"Maxwell's theory is Maxwell's system of equations"*, he showed us the beauty of Maxwell's equations. The love and the passion with which he spoke of these issues were astonishing. Even in the last years of his life, he dedicated himself to the study of the foundations of Analytical Mechanics (Giaquinta 2012, 2013) and Electromagnetism (Giaquinta 2009).

All of us had already heard of Prof. Gaetano Giaquinta as the "myth" of Mechanical Engineering, a Professor one would either love or hate. His course of Physics II was "one of a kind", since the contents of his lectures had little or nothing to do with the programmes of the other courses of the same discipline that were taught in our University. The classes of Prof. Giaquinta were always enriched with historical notes and quotations from Dirac, Feynman, Pauli, Weyl, and other "heroes" of modern Physics. Perhaps, we were too young at that time to fully appreciate the depth of those teachings, but they remained somehow imprinted in our minds, and have hopefully guided us through our scientific life. If we were asked now to summarise in few words Prof. Giaquinta's concept of science, we would probably pick up two quotations – both from Dirac – that Prof. Giaquinta often liked to evoke. When he spoke about the concept of Beauty in science, he often referred to Dirac's sentence (cf., *e.g.*, Kragh 1990):

> *"A theory with mathematical beauty is more likely to be correct than an ugly one that fits some experimental data."* (P.A.M. Dirac)

Moreover, when he wanted to highlight the conceptual power of Lagrange's method to approach science (*and life*, as he used to say), he quoted a statement given by Dirac in his paper *"The Lagrangian in Quantum Mechanics"* (Dirac 1933), in which the Author writes:

> *"The two formulations* [the Hamiltonian and the Lagrangian one (A/N)] *are, of course, equivalent, but* ***there are reasons for believing that the Lagrangian one is the more fundamental.****"*

Prof. Giaquinta loved the Lagrangian formalism. In the class in which he showed us how to obtain the Euler-Langrange equations from Hamilton's Principle, after writing on the blackboard the celebrated equations (Landau and Lifshitz 1969)

$$\frac{\partial \mathscr{L}}{\partial q} - \frac{\mathrm{d}}{\mathrm{d}t}\frac{\partial \mathscr{L}}{\partial \dot{q}} = 0, \tag{1}$$

he said:

> *"And now, we should all stand up and applaud!"*

In addition to what has been narrated so far, Prof. Giaquinta's lectures were made quite unique by the fact that the formal statement of physical concepts was often accompanied by deep remarks, typically followed by the declamation of some verses of Dante Alighieri's *Divina Commedia*, and sagacious jokes (told in Sicilian dialect!). When Prof. Giaquinta ran into someone who had been his student, and the student quoted one of his jokes, Prof. Giaquinta used to reply:

> *"You see, my dear, you remember the fundamental things. You understood everything!"*

There were cases, in fact, in which the *Divina Commedia* was quoted, and then parodied. That happened, for instance, when Prof. Giaquinta wanted to reply, friendly but mockingly, to a student who had answered one of his questions with a nonsense. A rather famous example of the sort was the verse

> *"O animal grazioso e benigno [...]"*[3],

taken from the *Canto V*, verses 88–90, of *Inferno* of Dante's *Divina Commedia*, which Prof. Giaquinta reformulated as

> *"O animal* per nulla *grazioso e* tutt'altro che *benigno [...]"*[4].

Among the students, there was no general consensus about Prof. Giaquinta: for some of them he was a genius who spoke about fascinating things in an incomprehensible way; for others he spoke about incomprehensible things in a fascinating manner. In fact, Prof. Giaquinta did not use to strive to adapt Physics to his audience, with the purpose of making it accessible to everyone. Rather, he tried to bring everybody to his level. He did not do that because he was stubborn, but because he believed in what he preached, and gave no room to intellectual compromises. Still, even when he could not reach the brain of people, he was able to touch their heart.

---

[3] *"O thou benign and gracious living creature,* [...]*"* (Langdon 1918). In the original Italian version, the substantive *"animal"* means "human being", *i.e.*, a being with a soul (*anima*, in Italian).

[4] *"O thou* not at all *benign and* far from being *gracious living creature,* [...]*"* (Authors' adaptation of the translation by Langdon (1918)). In Prof. Giaquinta's parody, the substantive *"animal"* was to be understood in the true sense of the word, *i.e.*, "element of the biological kingdom known as *Animalia*".

Prof. Giaquinta's classes often ended late in the evening, and went on "after-hours" with a few tireless listeners. The custodian of the building in which the lectures took place "threatened" him and his faithful students that he would lock them up in the building. Hence, Prof. Giaquinta and his "flock" would move out of the building towards Prof. Giaquinta's old car. Then, the last part of the lecture took place with Prof. Giaquinta speaking, one foot in the car, until he glanced at his wristwatch and realised that he had to go home immediately. Before going further, few words should be also dedicated to Prof. Giaquinta's old car, which was, in fact, part of his classes. That car was so old that nobody – not even his mechanic – figured out how it could still go. Somebody joked that the car worked against the laws of Classical Physics, since it actually was a "quantum car".

The lectures of Structure of Matter, a course that Prof. Giaquinta delivered at the fourth year of Mechanical Engineering, were held in a similar fashion but, this time, they were addressed to a more passionate audience, since they were programmed only for the students who attended the study plan denominated *"Materials"*[5]. That was another chance to learn from Prof. Giaquinta, spending time together both during the classes and during long informal discussions in his office. There, he proudly showed us part of his enormously vast book collection. Despite the huge number of books that he was able to house in his office, he knew by heart the location of each of them. So, depending on our questions, he could suggest us a reading by simply glancing at the book shelters, and telling us in which row we would have found the book that we were seeking.

Prof. Giaquinta's love for books was not second to his love for paintings. His office, indeed, was quite a miniature of an art gallery. He spent a lot of time commenting the paintings that he possessed and those submitted to his critique. He was able to see things that others could not see and he liked to interpret them under the light shed by Quantum Mechanics. It is not easy for us to express in words the emotions that he was able to convey while doing this, and this Preface is perhaps not the best place to even try to mention the passion he put in his continuous search for Beauty as the unifying language of Science and Art. However, he did put passion in it and, in the last years of his life, he used his comprehension of Physics to write critiques for young and talented painters.

More funny anecdotes might be told about Prof. Giaquinta and his books and paintings. Here, we do not fuss over such stories, but we feel that the Readers might be delighted to see Prof. Giaquinta "at work", accomplishing the task of putting order in the collection of paintings that were "permanently exposed" in his office (see Fig. 1).

3. Prof. Giaquinta and our scientific lives

Prof. Giaquinta's scientific life suffered an interruption due to rather serious health issues[6]. In 2002, however, his health conditions improved, and he could dedicate himself again to science and to the education of students. When that happened, Alfio Grillo (AG) had just received a proposal for a *Laurea* thesis from Salvatore Federico (SF)[7] and Prof. Guido

[5]At that time, the *Laurea* degree in Mechanical Engineering was a five-year course, the last two years of which were devoted to specialisation studies. Among other options, one could take the specialisation in *Materials*.

[6]Much of the biographical information about Prof. Giaquinta and the authors has been recently summarised by Federico and Grillo (2018).

[7]At that time, Salvatore Federico was a PhD student in Structural Mechanics at the University of Catania, under the supervision of Prof. Guido La Rosa.

FIGURE 1. Prof. Gaetano Giaquinta "at work", while he is attaching a painting to the wall of his office dedicated to art (picture taken by Dr. Giandomenico Zingali).

La Rosa (The University of Catania). The proposal was to work on a problem, suggested by Prof. Marcelo Epstein (The University of Calgary, Canada), that concerned the mechanics of growth in biological tissues. Starting from the seminal paper by Epstein and Maugin (2000), after some time AG came up with the idea of adopting the framework of Noether's theorem and the concept of broken symmetries to re-interpret part of the theoretical results of Epstein and Maugin (2000). Since we (AG and SF) both knew that Prof. Giaquinta was an expert of Classical Field Theory, we turned to him for advise and help, and Prof. Giaquinta supervised AG's thesis together with SF and Prof. La Rosa in Catania, while Prof. Epstein gave us his critical and helpful feedback from Canada. Afterwards, thanks to the collaboration between AG and SF, and the supervision of Prof. Giaquinta, Prof. La Rosa, and Prof. Walter Herzog (The University of Calgary, Canada), we published our first work on growth (Grillo *et al.* 2003).

After graduating, AG became a PhD student of Prof. Giaquinta and, even though AG and SF were PhD students of different professors and in different Departments, they collaborated continuously all through the years. In fact, as stated by Federico and Grillo (2018), SF was a *"faithful and permanent 'tangential affiliate' of the group* [of Prof. Giaquinta]*"*. The collaboration between AG and SF led also to other joint works, which took a huge benefit from Prof. Giaquinta's experience. In 2005, we wrote a paper in which the Path Integral formalism (Wiegel 1986) was reformulated in the context of Continuum Mechanics for

modelling growth in biological tissues (Grillo *et al.* 2005). In our research on growth, the work by Epstein and Maugin (2000) played a guiding role.

Furthermore, SF proposed several interesting problems and ideas that originated from his studies on articular cartilage with Prof. Herzog, Prof. La Rosa, and Dr. Sang-Kuy Han. These investigations conducted to the formulation of a *"transversely isotropic, transversely homogeneous microstructural statistical model of articular cartilage"* (Federico *et al.* 2005), and provided the basis for studying the *"mechanical behaviour of chondrocytes predicted with a micro-structural model of articular cartilage"* (Han *et al.* 2007). Furthermore, thanks to a collaboration with Prof. Shoji Imatani (Kyoto University, Japan), we wrote our first paper on remodelling (Federico *et al.* 2007).

When, in 2004, Dr. Han was visiting our group in Catania, a prominent issue of our research was the modelling of the orientation of collagen in articular cartilage. At that time, SF had produced an interpolation of an experimental curve that represented the mean angle of the collagen fibres as a function of the tissue depth. The curve had a sigmoidal shape that, in the mind of Prof. Giaquinta, was immediately catalogued as the manifestation of a *structural phase transition*. In fact, he exclaimed (Federico and Grillo 2018):

> *"This is a structural phase transition and it has to be describable by a Ginzburg–Landau free energy ..."*

Prof. Giaquinta launched this statement, and handed it over to us without adding a word. While this idea silently ripened in our minds, we coped with other challenges and, after our PhD studies, we moved to foreign universities (SF went to Canada, and AG went to Germany), where our research focussed on different problems. However, Prof. Giaquinta's idea kept tacitly growing and, when it became clear how to model a structural phase transition in the framework of fibre-reinforced materials with statistically oriented fibres, it then became urgent to write about it. When that happened, his words re-emerged as clear as if they had just been spoken, and led us to a joint work (Grillo *et al.* 2018), with which we finally accomplished the task that Prof. Giaquinta had given to us many years before.

From 2002, also other students joined Prof. Giaquinta's revived group and were supervised by him for the *Laurea* or the PhD thesis. Among those students, who are now esteemed professionals and researchers, we mention (in chronological order) Dr. Giandomenico Zingali, Mr. Diego Maria Borrello, Dr. Marco Caruso and Dr. Marco Coco. Our warmest gratitude goes to each of them for their valuable work, sympathy, scientific cooperation, and for having contributed to create a friendly work atmosphere in Prof. Giaquinta's group.

Also thanks to the efforts of Dr. Zingali and Dr. Caruso, Prof. Giaquinta organised in October 2008 the eighth edition of the international seminar *Geometry, Continua and Microstructure – GCM8*[8], which took place at the University of Catania (Italy), in the splendid location of *Villa Citelli*. The seminar gathered both young and senior scientists from various countries, and established a fruitful interdisciplinary platform for the exchange of ideas and the drawing up of scientific collaborations among the participants. Moreover, Prof. Giaquinta, Prof. Gérard A. Maugin (2nd of December 1944 – 22nd of September 2016), Prof. Milan V. Mićunović and Prof. Robin W. Tucker edited the volume "Geometry, Continua, and Microstructure 2008", published in 2009 in the international journal *Il Nuovo*

[8] http://www.dmfci.unict.it/users/gcm8/

Cimento C of the *Società Italiana di Fisica* (Italian Physical Society), and containing the papers presented at GCM8 (Federico and Grillo 2018).

From 2009 until the end of his life, Prof. Giaquinta was a corresponding member of the *Accademia Peloritana dei Pericolanti*,[9] and contributed to the official journal of the Science Division of this institution (*i.e.*, the present journal) with the papers *"On the dynamic equivalence of Lagrangians differing up to the total time derivative of an arbitrary function of coordinates and time – A note on the foundation of electromagnetic theory as a gauge theory"* (Giaquinta 2012) and *"On the Lagrangian being a homogeneous function of the velocity – A methodological note"* (Giaquinta 2013).

Last, but not least, we are pleased to recall that Prof. Gaetano Giaquinta was the first President of the Scientific Committee of the *Fondazione Floresta-Longo*[10], an institution that, both in Catania (Italy) and at an international level, thrusts and encourages the diffusion of all facets of science through the organisation of conferences and the promotion of scientific projects, and creates opportunities for young, talented people.

4. Contributions to this Special Issue

This Special Issue consists of the present Preface and six contributions, each of which has been authored or co-authored by scientists who either have been friends of Prof. Gaetano Giaquinta or have known him through our stories about him. In particular, Carfì and Campbell (2018) contributed a paper on Financial Mathematics addressing the issue of *"Speculative and hedging interaction model in oil and U.S. dollar markets"*. The Authors study the interactions between a *"real economic subject"* and *"one or more investment banks"*, and highlight that the existence of equilibria is connected with the concept of phase transitions. Consoli and Pluchino (2018) review some aspects of the foundations of General Relativity and, more precisely, suggest new experiments with the aim of indicating the motion of the Earth *"within the Cosmic Background Radiation"*. Consolo and Valenti (2018) investigate the motion of a magnetic domain wall in *"nanoscale multiferroic devices"*. The Authors determine analytically the velocity of the domain wall motion in the steady case and perform their study in the presence of *"magnetostriction, Rashba field, and dry-friction"*. With the scope of improving the understanding of optoelectronics, Faraci (2018) discusses and comments on some results on the enhancement of energy in the photoluminescence of GE nanocrystals. Luca and Romano (2018) report on a study on hydrodynamical models for the transport of charges in graphene. For their purposes, the Authors elaborate a model that relies on the Principle of Maximum Entropy, and particularise their approach to the case of moments. Finally, Mirone *et al.* (2018) present an experimental work, in which they consider the onset of necking in metals, and investigate the *"interruption of the strain rate sensitivity"* for such materials.

5. Gaetano Giaquinta's Legacy

The death of a mentor marks the end of an era, and is a handover to the closest disciples, *i.e.*, the ones who have received the most "intimate" teachings. As closest disciples of Prof.

[9] See G. Giaquinta's *Curriculum Vitae et Studiorum*, available at http://fondazioneflorestalongo.it/team/gaetano-giaquinta/

[10] http://en.fondazioneflorestalongo.it

Giaquinta, we feel the moral duty of enriching his teachings with our own experiences, so to transmit a mixture of old and new knowledge to our own students.

Life has blessed both of us – Salvatore Federico and Alfio Grillo – permitting us to become University Professors. This was, in fact, our dream since we were undergraduate students. Prof. Gaetano Giaquinta has undoubtedly given us a determinant contribution to understand what to do with our lives, and we have soon realised that we wanted to talk to students, tell them our stories, *profess* our disciplines, and help other people to find their own way in life.

Several years have passed since we were PhD students at the University of Catania, but we still have clear memories of those times: we remember the walks along the alley between the old and the new building of the Faculty of Engineering (the offices of Prof. Giaquinta and AG were in the old one, while the office of SF was in the new one); our first papers, written late at night; the long discussions about science and private life; and we remember the plans for the future, when we said *"I would like to be ..."*, with a lot of thoughts in our minds, dreams in our heart, and the blue sea of the Gulf of Catania on the background.

Acknowledgments

AG warmly thanks Dr. Ariel Ramírez Torres (Politecnico di Torino, Italy) for his invaluable help with the editing of the manuscripts accepted for publications in this special issue. The *Fondazione Floresta Longo* (Catania, Italy) is cordially acknowledged.

References

Carfì, D. and Campbell, M. (2018). "Speculative and Hedging Interaction Model in Oil and U.S. Dollar Markets—Nash Equilibria for One or More Banks". *Atti della Accademia Peloritana dei Pericolanti. Classe di Scienze Fisiche, Matematiche e Naturali* **96**(1), A1 [20 pages]. DOI: 10.1478/AAPP.96S1A1.

Consoli, M. and Pluchino, A. (2018). "The Classical Michelson-Morley Experiments: A New Solution To An Olf Problem". *Atti della Accademia Peloritana dei Pericolanti. Classe di Scienze Fisiche, Matematiche e Naturali* **96**(1), A2 [29 pages]. DOI: 10.1478/AAPP.96S1A2.

Consolo, G. and Valenti, G. (2018). "Magnetic Domain Wall Motion in Nanoscale Multiferroic Devices Under The Combined Effect Action Of Magnetostriction, Rashba Effect and Dry-Friction Dissipation". *Atti della Accademia Peloritana dei Pericolanti. Classe di Scienze Fisiche, Matematiche e Naturali* **96**(1), A3 [19 pages]. DOI: 10.1478/AAPP.96S1A3.

Dirac, P. A. M. (1933). "The Lagrangian in Quantum Mechanics". *Physikalische Zeitschrift der Sowjetunion* **3**(1), 64–72.

Epstein, M. and Maugin, G. A. (2000). "Thermomechanics of Volumetric Growth in Uniform Bodies". *International Journal of Plasticity* **16**(1), 951–978.

Faraci, G. (2018). "Evidence Of Energy Enhancement In Photoluminescence Emission From GE Nanocrystals". *Atti della Accademia Peloritana dei Pericolanti. Classe di Scienze Fisiche, Matematiche e Naturali* **96**(1), A4 [10 pages]. DOI: 10.1478/AAPP.96S1A4.

Federico, S. and Grillo, A. (2018). "Preface to the Special Issue in Memory of Prof. Gaetano Giaquinta (1945–2016)". *Mathematics and Mechanics of Solids* **–**(–). DOI: 10.1177/1081286518766746.

Federico, S., Grillo, A., Herzog, W., Giaquinta, G., and Imatani, S. (2007). "Possible Approaches in Modelling Rearrangement in a Microstructured Material". *Key Engineering Materials* **340–341**, 137–142. DOI: 10.4028/www.scientific.net/KEM.340-341.137.

Federico, S., Grillo, A., La Rosa, G., Giaquinta, G., and Herzog, W. (2005). "A Transversely Isotropic, Transversely Homogeneous Microstructural-Statistical Model of Articular Cartilage". *Journal of Biomechanics* **38**(10), 2008–2018. DOI: 10.1016/j.jbiomech.2004.09.020.

Felsager, B. (1989). *Geometry, Particles, and Fields*. Springer-Verlag New York, Inc.

Giaquinta, G. (1968). "Correnti Josephson in Giunzioni superconduttrici con isolante non-convenzionale". *Laurea* Thesis, University of Catania.

Giaquinta, G. (2009). "Gauge invariance and effective sources in classical electrodynamics—A methodological note". *Il Nuovo Cimento C* **32**(1), 89–96. DOI: 10.1393/ncc/i2009-10337-4.

Giaquinta, G. (2012). "On the dynamic equivalence of Lagrangians differing up to the total time derivative of an arbitrary function of coordinates and time — A note on the foundation of electromagnetic theory as a gauge theory". *Atti della Accademia Peloritana dei Pericolanti. Classe di Scienze Fisiche, Matematiche e Naturali* **90**(2), A1 [8 pages]. DOI: 10.1478/AAPP.902A1.

Giaquinta, G. (2013). "On the Lagrangian being a homogeneous function of the velocity—A methodological note". *Atti della Accademia Peloritana dei Pericolanti. Classe di Scienze Fisiche, Matematiche e Naturali* **91**(2), A4 [9 pages]. DOI: 10.1478/AAPP.91S2A4.

Grillo, A., Carfagna, M., and Federico, S. (2018). "An Allen-Cahn Approach to the Remodelling of Fibre-Reinforced Anisotropic Materials". *Journal of Engineering Mathematics* **109**(1), 139–172. DOI: 10.1007/s10665-017-9940-8.

Grillo, A., Federico, S., Giaquinta, G., Herzog, W., and La Rosa, G. (2003). "Restorations of Symmetries Broken by Reversible Growth in Hyperelastic Bodies". *Theoretical and Applied Mechanics* **30**(4), 311–331. DOI: 10.2298/TAM0304311G.

Grillo, A., Zingali, G., Federico, S., Herzog, W., and Giaquinta, G. (2005). "The Role of Material Inhomogeneities in Biological Growth". *Theoretical and Applied Mechanics* **32**(1), 21–38. DOI: 10.2298/TAM0501021G.

Han, S.-K., Federico, S., Grillo, A., Giaquinta, G., and Herzog, W. (2007). "The Mechanical Behaviour of Chondrocytes Predicted with a Micro-Structural Model of Articular Cartilage". *Biomechanics and Modeling in Mechanobiology* **6**(3), 139–150. DOI: 10.1007/s10237-006-0016-3.

Kragh, H. S. (1990). *Dirac: A Scientific Biography*. Cambridge University Press, Cambridge.

Landau, L. D. and Lifshitz, E. M. (1969). *Mechanics*. Pergamon Press (2nd Edition), Oxford.

Landau, L. D. and Lifshitz, E. M. (1971). *The Classical Theory of Fields*. Pergamon Press (3rd Edition), Oxford.

Langdon, C. (1918). *The Divine Comedy of Dante Alighieri. The Italian Text with a Translation in English Blank Verse and a Commentary by Courtney Langdon, vol. 1 (Inferno)*. Cambridge Harvard University Press, Cambridge (http://oll.libertyfund.org/titles/alighieri-the-divine-comedy-vol-1-inferno-english-trans).

Luca, L. and Romano, V. (2018). "Hydrodynamical Models For Charge Transport In Graphene Based On The Maximum Entropy Principle: The Case Of Moments Based On Energy Powers". *Atti della Accademia Peloritana dei Pericolanti. Classe di Scienze Fisiche, Matematiche e Naturali* **96**(1), A5 [24 pages]. DOI: 10.1478/AAPP.96S1A5.

Mirone, G., Corallo, D., and Barbagallo, R. (2018). "Interruption Of The Strain Rate Sensitivity Of Metals At The Necking Onset". *Atti della Accademia Peloritana dei Pericolanti. Classe di Scienze Fisiche, Matematiche e Naturali* **96**(1), A6 [15 pages]. DOI: 10.1478/AAPP.96S1A6.

Newton, I. (1687). *Philosophiae Naturalis Principia Mathematica*.

Watson, A. (1986). "Physics—Where the action is". *New Scientist* **–**(30 January 1986), 42–44.

Wiegel, F. V. (1986). *Introduction to Path Integral Methods in Physics and Polymer Science*. World Scientific Publishing Co., Pte., Ltd., Singapore, USA.

[a] Politecnico di Torino
Dipartimento di Scienze Matematiche (DISMA) “G.L. Lagrange”
Corso Duca degli Abruzzi 24, 10129 Torino, Italy

[b] The University of Calgary
Department of Mechanical and Manufacturing Engineering
2500 University Drive NW, Calgary, AB T2N 1N4, Canada

* To whom correspondence should be addressed | email: alfio.grillo@polito.it

Manuscript received 5 June 2018; published online 13 August 2018

© 2018 by the author(s); licensee *Accademia Peloritana dei Pericolanti* (Messina, Italy). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution 4.0 International License (https://creativecommons.org/licenses/by/4.0/).