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EDITORIAL

Celebrating the life of John Kenward Gilbert

Introductory notes

When John was invited to organise his selected works in a book to the Routledge series World Library of Educationalists, he wrote in the Preface that the invitation to compose 'what amounts to a "professional autobiography of ideas"' was 'a most disconcerting experience'. He thought that 'to address the task efficiently, one would need to be both many years away from all relevant facts and to be emotionally detached from them' (Gilbert, 2005a, p. 1).

Today, I feel I am in the very same situation. I hope this text may make those who shared moments with him remember them smiling, and those who have not had such an opportunity to wish they could have met him.

Personal and professional births and initial developments

John was born on 27th April 1940, in London, just some months before the city started being bombed. More than once he told me that, due to having been a Londoner child during the II World War, he had been invited to participate in some psychological studies about whether and how the war affected children's emotions. He was proud to have always been a point outside the data curves that showed kids with psychological traumas, to have found a way to become a happy single child at those difficult times.

In the Preface above, John recalled regularly visiting the Science Museum and the Dome of Discovery as a child. The artefacts he saw in both of them, as well as the work of a physics school teacher who established clear relationships between phenomena and the abstract ideas that explained them, increased his interest in both science and 'teaching to promote thinking' (Gilbert, 2005a, p. 2) – two issues that guided his professional career.

Some years later, in 1962, he got a B.Sc. (Hons.) Chemistry from the University of Leicester, which was followed by a D.Phil. Chemistry from the University of Sussex in 1965. But rather than get a university chemistry post, he became an Assistant Master for chemistry at the King's School, in Rochester, where he taught for three years.

In 1968, John was granted a Postgraduate Certificate in Education (Science) from the University of London, and, in the same year, he became the Head of Chemistry at a large comprehensive school: the Banbury School (now the Wykham Park Academy), in Oxfordshire. There, he 'started to think beyond the confines of the immediate classroom and laboratory' (Gilbert, 2005a, pp. 2–3) and had the opportunity to teach from the Nuffield 'A' Level Chemistry. Due to his experience, John was asked to give a lecture on the Nuffield 'A' Level schemes to members of the Association for Science Education. He acknowledged this was one of the first times he was convinced that, if approached from a coherent intellectual basis, science education could be an exciting and fun experience for both students and teachers. It seems that the years John spent as a chemistry teacher became a seedbed for the development of future ideas on children's ideas.

First steps as a prominent researcher

From such enthusiastic and embryonic ideas in mind, John started his university career in 1972, at the University of Keele, as a Lecturer in Science Education (a period of time when he was also a Professional Tutor at Shrewsbury School, in Shropshire). Soon he moved to the University of Surrey, in Guildford, when he worked as Senior Lecturer and Reader in Science Education from 1974 to 1988. More than once, he told me that Surrey was the university where he most enjoyed working because there was a pleasant and favourable environment to think, learn, and exchange ideas.

At the Institute of Education Technology of the University of Surrey, John participated in the creation of an innovative course which combined physics (or chemistry) with education and granted both a degree of the University and a teaching certificate. The course was created in conjunction with Bulmershe College of Higher Education, in Reading, and was motivated by worries about 'the future of science in schools and universities' (Gilbert, 1975, p. 516) – something that attracted John's attention in distinct stages of his academic career, leading to distinct initiatives.

It was at Surrey that John started his ample circle of international collaborations – something that he highly valued. John's first international collaborator, Roger Osborne, who he recognised as 'one of the leading lights of his generation' (Gilbert, 2009a, p. 322), was one of the main ones in this entire career, as well as one of his best friends. When replying the questions that resulted in his contribution to Peter Fensham's (2004) book *Defining an Identity: The Evolution of Science Education as a Field of Research*, John revealed that, for years after Roger returned to Hamilton after a short stay in Guilford in 1979–1980, they were in touch almost every week to discuss ideas. Since the mid-1970s, the importance of identifying and considering students' conceptions in science education had been the topic of studies conducted by A. Champagne, J. Clement, R. Driver, R. Gunstone, J. Novak, J. Nussbaum, R. White (among many others). In a not very well-known paper (Gilbert, 1977), John informed that at the University of Surrey they had been interested in such matters for some time. As a result, in 1976, they started a tentative work

> "done jointly with Visiting Staff", with "a number of aims: to investigate the usefulness of different question types for diagnosis, to look for patterns of performance within higher education and for trends between school and higher education, to explore types of result analysis and presentation likely to be of greatest use to practising teachers, and to seek a formula for future diagnostic procedures". (p. 166)

It is likely that as a consequence of this project, or as part of it, the fruitful collaboration with Roger Osborne had started. Together, they made a significant methodological contribution to the area by producing an original, simple, and powerful tool for collecting data on such conceptions: the Interview about Instances (Osborne & Gilbert, 1980). Assuming the importance of students' ideas, as well as limitations of instruments being used to collect data at that time (including the self-evolving questionnaire, that had been produced some years earlier (Bridge & Gilbert, 1977)), they concluded that:

> "We could just simple ask them, but what could we use as stimulus (…) We came to stick figures, on the basis that they were less contextualised, (…) Then we sat down and thought of a variety of situations in which the concept of interest could or could not have application, because I remembered Dudley Herron had used instances and non-instances of concepts in one of his chemistry studies." Two single questions were asked about each figure: "Is this an example of C (the concept)? Why?" (Fensham, 2004, p. 124)

Due to the simplicity to be produced, replicated, and administered, as well as to the results obtained, hundreds of studies were conducted using the Interview about Instance on a series of scientific concepts (Fensham, 2004). In one of them, John and colleagues identified a set of challenging concerns:

> is it invariably desirable or feasible to change all students towards the consensus scientific viewpoint?; what implications are there for class composition and syllabus construction?; what changes in examination techniques do they imply?; how do patterns of student conception relate to the historical development of a subject? The future of this field of interlocked research and development seems likely to be a busy one. (Gilbert et al., 1982, p. 66)

The future showed they were absolutely right. The research programme on students' conceptions of science concepts was certainly one of the most successful in science education due not only to the amount of empirical studies developed – summarised in a series of reviews and books (e.g. Driver (1983); Driver et al., 1985; Gilbert et al., 1982; Gilbert & Watts, 1983) –, but also to the emergence of a new field of research related to how students learn, and to the formation of a whole generation of researchers who led the area for the next decades.

Moving ahead

At the same time John was involved with the research briefly described above and with the supervision of his first PhD students, he became interested in the parallels between the processes of science and science teaching. It seems such interest was first expressed in a paper, also written in collaboration with Roger Osborne, in which they discussed 'the types and uses of models found in science and science teaching', explored 'the contention that the misuse of models in science teaching can lead to misunderstandings by students of both models and their embodied concepts' (Gilbert & Osborne, 1980, p. 3), and raised a series of questions to guide further investigations. However, it was only some years later that the topic 'model' was focused on in John's studies.

In 1988, he became Professor of Science Education at the University of Reading, where he worked until his official retirement in 2005, when he was bestowed the title of Professor Emeritus. There, together with Carol Boulter, he ran the Centre for Models in Science and

Technology: Research in Education (CMISTRE), an international collaborative venture that brought together people who have an interest in models (including analogies) and modelling. From 1994, I had the privilege of becoming a member of the CMISTRE, one of the most remarkable experiences I have had during my Ph.D. course. For short stays or for attending the regular seminars where new ideas were democratically discussed, John invited scholars from the UK, Australia, Brazil, Israel, New Zealand, South Africa, and the USA. One of the seminal publications of the CMISTRE was the book *Developing Models in Science Education* (Gilbert & Boulter, 2000). It expressed ideas developed by the members of CMISTRE at that time, grouped in three sections focused, respectively, on the nature and significance of models, the development of mental models, and the teaching and learning of consensus models. Mainly due to John's comprehensive view on knowledge that he spread among the members of the Group, the book was based on ideas from disciplines like philosophy, history, sociology and language of science, and psychology of science teaching and learning. One example of the integration of ideas from distinct disciplines was the concept of hybrid model, initially published in one of the papers originated from my Ph.D. thesis (Justi & Gilbert, 1999) and discussed in one of the chapters of the book (Justi, 2000). It clearly illustrated John's view that, on the one hand, a significant idea should be obvious and clearly expressed, whilst on the other, it should make people think about and from it. In his academic life, several ideas had such characteristics (like the ones that based the previously discussed Interviews about Instances).

From the initial studies reported in that book, as well as from John's belief that science education must be more authentic (that is, 'as closely alike the conduct of science per se as is possible under the current conditions of mass education' (Gilbert, 2004, p. 116)), his interest in models and analogies advanced resulting in a new research programme focussed on modelling. Some of his previous ideas, like those concerning thought experiments – approached initially when he was at Surrey (Helm et al., 1985; Helm & Gilbert, 1985) and detailed later (Gilbert & Reiner, 2000; Reiner & Gilbert, 2000) – were crucial in that new enterprise.

In the first research project I coordinated after my Doctorate, John participated as a researcher and, as he always used to do, he made this an opportunity of mutual learning and production of knowledge. In the context of that project, when we started analysing the ideas expressed by teachers from distinct educational levels about models and modelling, we felt the need to deeply understand the meaning of modelling in science. This led us to study the philosophy of science, and the history of the development of some scientific ideas, as well as John Clement's (1989) ideas on modelling in science education – all of which inspired and informed our own ideas. In a well-known paper in which we published some of the results of that project (Justi & Gilbert, 2002), we proposed the first version of our Model of Modelling, a diagrammatic representation of how we understood the process. In the following years, that Model supported many empirical studies conducted in Brazilian regular classrooms that aimed at increasing the authenticity of science teaching through modelling-based teaching (MBT). All of them were discussed in the book that both brought together research we conducted during 15 years and presented our new studies and countless discussions mainly occurred from 2012 to 2015. Such discussions also resulted in the production of the new version of the Model of Modelling (Gilbert & Justi, 2016).

This book (which since its launch has been one of the top 25% best-selling books published by Springer) also shows how we managed to broaden our ideas and analysis of MBT situations by discussing issues concerning the contributions of MBT to a more authentic science education, the role of argumentation in MBT, the contributions of visualisation to MBT, analogies and analogical reasoning in MBT, the learning about science through MBT, learning progressions during MBT, and the education of teachers to facilitate MBT. In the last chapter,

we also focus on challenges and novel perspectives, most of which have been addressed in the studies conducted in the last years. The discussion of some of them was interrupted by his unexpected death, last 9th February.

Two of the topics discussed in the book showed how he tried to think outside the box by approaching a given subject from distinct and innovative perspectives. One topic is visualisation, about which he wrote papers and individual chapters (e.g. Cheng & Gilbert, 2015; Gilbert, 2009b) and edited three books (Eilam & Gilbert, 2014; Gilbert, 2005b; Gilbert et al., 2008). In the introductory chapter of the first of these books, he explained that the emergence of visualisation as a focus of research could be related to two factors: the increasing

> "emphasis being placed on introducing students, at all levels of the education system, to the nature and processes of science"; and "the ready availability of powerful computers with which models, especially dynamic models and simulations, can be displayed and manipulates in a virtual format" (Gilbert, 2005c)

This justified the attempt of bringing together computer software specialists, scientists, and educationalists drawing on the insights from science, education, and cognitive psychology, in order to disseminate their ideas and promote the formation of links between them – which is also promoted in the second book. On the other hand, the third book discusses how science teachers use visual representations in diverse ways (mainly by using different diagrams, simulations and slow-motions), and in culturally diverse classrooms, as well as the place of visualisation in informal science education.

Thinking on teachers' development

The second topic discussed in one of the chapters of our book that had permeated John's previous projects and publications is teachers' development. A book published 20 years before (Bell & Gilbert, 1996), based on the findings of a three-year research project, presented and illustrated a model that integrates teachers' personal, professional, and social development. In Bell's view, the book is a significant contribution because it continues

> the debate about constructivist views of learning as applied to teacher education, moving it forward from personal into social constructivism, including what it means to be a science teacher on a collective basis. (Fensham, 2004, p. 110)

The teachers' development model proposed in this book also based John's additional reflections on the topic in a more recent chapter (Gilbert, 2010), where he also discussed the challenges of becoming an effective science teacher; approaches to successful professional development; and good practices in the organisation of teacher development activities.

As for teachers' development, a particular important project was coordinated by John and Matthew Newberry: the Cams Hill Science Consortium. It started in 2001 by involving teachers from six secondary schools in a collaborative classroom-based action research, a network that, by 2007, had expanded to teachers from over 30 primary and secondary schools in South East England (Gilbert & Newberry, 2007). From John and Matthew's initial ideas that models and modelling have a great potential to engage students in science lessons, issues concerning models and modelling were introduced, developed, and discussed during meetings. After each meeting, the teachers applied the discussed ideas in their classes and prepared a report of the outcomes to be presented and discussed in the next meeting. When commenting about this project, John always emphasised that (i) the production and discussion with the teachers of the representation for increasing levels of understanding required by the British National Curriculum and based on the distinct approaches to

learning about models and modelling[1] were so interesting; and (ii) the outcomes of the project in terms of most teachers' engagement and level of reflection about their actions and what had happened in their classes. After so many years working at universities, returning to schools, even as a collaborative researcher, was a relevant experience in terms of giving him feedback on the application of many of the ideas he developed in collaboration with distinct colleagues throughout his career. In his words:

> I propose to ignore it (the retirement age of 65). The future looks bright, for I am now working ever-more intensively with Matthew Newberry and the teachers of the Cams Hill Science Consortium, who are conducting action research into the significance of 'models and modelling' for all aspects of the school science curriculum. (…) It would be wonderful, at the close of a career of 40 years, to be able to help science teachers of England regain some sense of professional self-determination after many years in the wilderness of the 'Stalinist command economy' created by the educational policies of successive UK governments since 1988. There are glimmers of hope. (Gilbert, 2005a , p. 4)

Acting in some other areas

John was fascinated by chemical ideas, as well as the particularities and challenges involved in teaching and learning chemistry. At the National Association for Research in Science Teaching (NARST) conference held in St. Louis in 2001, conversations among a group of chemical educators from different nationalities and with distinct experiences in terms of teaching and research resulted in the decision of editing a book on chemical education from the research perspective – then a missing topic in the literature. The book was published some years later (Gilbert et al., 2003).

At the interface of the research on models and modelling, on visualisation, and on chemistry education, John also dedicated special attention to the difficulties faced by students (and teachers) when dealing with the three types of representation of chemical knowledge: macro, sub-micro, and symbolic ones (Johnstone, 1982). Besides having discussed such issues in the context of papers mainly based on the above mentioned research, John co-edited, with David Treagust, a book focused on multiple representations in Chemistry (Gilbert & Treagust, 2009). The great reception of the book among the chemical education community made John think that the knowledge and the teaching and learning of the other major sciences (Physics and Biology) should be approached from the same perspective. As the editor of the series in which the book on multiple representations in Chemistry was published, he went to great lengths to find editors for the books on multiple representations in Biology and Physics (published in 2013 and 2017, respectively).

The interplay of two areas in a book was also found in Gilbert and Stocklmayer (2013). Both of them – science communication and the relations between science and technology education – have been addressed in John's previous enterprises or publications. At the University of Reading, he had created a course on science communication which he ran for some years attracting a huge number of students. Nowadays science communication can be viewed as a scientific practice that involves many distinct groups (e.g. scientists themselves, mediators, funding agencies, the general public) that try to communicate to each other through several modes and communication vehicles that not always are proper to communicate a given message to a given audience. The discussion of these and other related topics in John's course on science communication from his experience of being a good listener and communicator, and from his knowledge on both models of representation and people may have been the main causes of the success of the course. On the other hand, he always claimed that technology (rather than science) was the main focus of interest of the general public

(including most of the students). Therefore, communication supported by evidence-based information involving technology education has to reach the general public. But how, if both are relatively new areas? That is the gap that this book tried to fill by providing an overview of the major issues concerning science and technology communication, an introduction to the research-based literature of the area, and suggestions for activities that may be explored by readers.

Finally, John's last published book (Rennie et al., 2019) addressed a topic he had been interested in for many years: adult and lifelong learning in science and technology. Like the central topic, the structure of this book is also different from all the others. Based on the analysis of case studies written by adults who learnt 'the science and technology they need to know in order to deal with issues in their everyday lives' (p. viii), the authors provide a research-based exploration of adults self-learning and tools to support adults' learning experiences.

Taking other positions

As John expressed in a previous mentioned quotation, he proposed to ignore the retirement age of 65 years. In the following year of his official retirement from the University of Reading, he started a Visiting Professorship at King's College London and, more recently, from 2017, he was an Honorary Fellow at the Australian National University. Apart from these official positions, he continued studying, participating in research projects with some colleagues, attending conferences (mainly the ESERA ones), writing papers and chapters, and editing books.

Due to his leadership in the area of models and modelling and his knowledge of the absence of seminal publications in the area, in 2003, after the book on Chemical Education had been published, John proposed to Springer the creation of the series of books *Models and Modelling in Science Education*. The aims of the series were related to issues he viewed as essential to the area: to draw together reports of research and evaluated innovations from throughout the world, so as to provide a global perspective on the field; to draw together research in the field that is conducted within diverse academic specialisms e.g. history and philosophy of science, cognitive science, the separate science disciplines, to provide an integrated whole; and to produce overviews of work in major sub-sectors of the field e.g. role in the curriculum, teaching methods, implications for teacher education. The first book published was the one on Visualisation, edited by him (Gilbert, 2005b). Until his death, John continued to be the series editor, dealing with proposals, helping book editors to produce relevant volumes. At the end of 2019, the 12th book of the series was published (Upmeier zu Belzen et al., 2019).

John was also invited by Routledge to edit the four volumes of the series *Major Themes in Education related to Science Education* (Gilbert, 2006). As requested by the title of the series, some of the most common important issues being debated in the area are addressed from distinct perspectives in the four volumes composed by 74 papers: 'Science, Education and the Formal Curriculum', 'Science Education and Assessment in the Formal Curriculum', 'Teaching and Learning in Science Education' and 'Conceptual and Teacher Development in Science Education'. By selecting such papers, John aimed at both providing students 'with an effective entry into the literature on complex themes', and supporting 'researchers in identifying important topics for enquiry' (v 1, p. 2). By having this later aim in mind, he tried to select papers whose authors were not only

> "from anglophone, industrially developed countries". Moreover, "Any lessons drawn from the articles included must be subject to the process of analogy to see if the topics addressed, the methods used, and the conclusions reached, are relevant in any particular national context. Unless this is done, there is a real risk of 'cultural imperialism' as one country's concerns are imported into another where they may be of marginal relevance." (v. 1, p. 2)

Only a world citizen who was really committed to promote science education that could make difference in people's life would think from such a perspective.

John was known as THE Editor of the *International Journal of Science Education* (IJSE), a post he occupied from 1991 to 2017! These were 26 years of dedication to improve the quality of the journal, to make it effectively international, to make it a vehicle of education for authors, reviewers and associate editors. John noted that the IJSE provided him

> with an opportunity to support science education at world level and especially to provide professional development for new and/or poorly resourced researchers. More selfishly, it enables me to keep abreast of trends in the field at global level. (Gilbert, 2005, p. 4)

From the discussions we had concerning editorship and difficult decisions, I (and I would say all the other associate editors who had the same kind of discussions with him) learnt a lot not only about science education or criteria to analyse manuscripts, but also about how to help authors to produce better papers.

Being awarded

In 2001, John received the NARST 'Distinguished Contributions to Science Education Through Research'. In his typical way of being, he said he 'was greatly honoured, and even more surprised to be given the annual award' (Gilbert, 2005, p. 4). I remember that, on the award day, he was wearing a special suit and had a large smile on his face and eyes (which I was fortunate to register in a photo), but kept it secret until his name was announced.

A different tribute, but I think as important as the NARST award, was a surprise ceremony funded by Taylor & Francis, the publishing of the IJSE, during the 2017 ESERA Conference in Dublin, in order to celebrate John's 29 years of dedication to the journal (since he had also been an associate editor from 1988 to 1991).

Thinking from a different perspective

John was knowledgeable and experienced and had an amazing amount of energy and clear thoughts about the directions for future research. He always tried to analyse what was being discussed from different perspectives and to ask hard and unexpected questions that others would avoid. In doing so, he advanced our thinking, he taught us that to face simple or complex situations with an open mind (and heart) and without prejudice against a given idea or approach may always be a way to reach a good result.

John respected and supported researchers of all nationalities and creeds (whether they were novices or experienced ones) and was always ready to introduce people to other people when this could result in the generation of an active synergy in research. He was also always willing to write reference letters with eagerness, objective and fairness, but maintaining a pleasant attitude. There aren't many people who can combine these qualities. This is one of the reasons John was special for many people.

John was an excellent, charismatic and inspiring mentor both in academic and personal life of his students (and, sometimes, his colleagues). He always listened to what was being said or asked trying to identify the relevant points to be emphasised in criticism or advice and leaving less relevant points out of focus. Maybe due to thinking broadly, to analysing facts and situations from distinct perspectives, or even as a kind of inheritance of having been a happy child (and a happy man), John had also a unique sense of humour, many times expressed in sincere smiles. And his smiles were special when directed at Julie, his beloved wife and company for more than 50 years. Being together with them in conference places (as many of those who may read this text know, Julie almost always accompanied him at conferences) or in their house, it was so sweet to see how they worried about each other (even in terms of ordinary things); how they took care of each other; how they supported each other; how, even being so different in some senses, they built their lives together.

It was my pleasure and great privilege to have met John, to have had him as my Ph.D. supervisor my main academic collaborator and inspiration for the last 25 years and, mainly, as a friend. So, to finish this text, I would like to thank you, John, for being such a special person. We, your friends, will miss you so much …

Note

1. Learning a curricular model, learning to use a model, learning to revise a model, learning to reconstruct a model, and producing learning to construct a model *de novo*, i.e. learning to modelling (Gilbert, 2004; Justi & Gilbert, 2002).

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