

EDITORIAL

Strain 50th Anniversary

The journal *Strain* was launched in January 1965 by the British Society for Strain Measurement (BSSM); 2014 marks its 50th anniversary. The year 2014 also marks the 50 years of the BSSM, and it is planned to have special events to mark the occasion. Of particular interest is the 16th International Conference on Experimental Mechanics, which is organised by the BSSM. Around 450 delegates are expected to attend representing wide-ranging international expertise in the topic that has become known as 'Experimental Mechanics'. More details on the conference can be found at www.icem16.org, but most importantly for *Strain*, there will be a 50-year celebration held at the Fitzwilliam Museum in Cambridge sponsored by Wiley where all delegates will be invited to attend. Throughout 2014, *Strain* will be publishing an overview paper in each issue covering the progress and prospects of key techniques and application areas. They will be made freely available online as well as the top 20 most cited papers in *Strain*.

Back in the 1960s, the fledgling BSSM was committed to industrial applications and decided that a journal that promoted the 'more practical side of stress analysis' was necessary to introduce the new experimental techniques to a wider audience. The first editor was G. S. Holister; in his editorial, he stated 'the prime concern of the editor and the editorial panel is to see that the standard of contributions should be both of the highest calibre and the greatest possible general interest'. These values are still today at the top of the agenda of the *Strain* editorial board.

In 2004, a retrospective of 40 years of *Strain* [1] appeared in the journal giving a complete overview of the changing profile of publications in the journal over the preceding four decades. From this, some interesting facts emerge about the changing profile of experimental stress analysis and its development into the more wide-ranging genre of experimental mechanics. In the first 10 years, the publications were dominated by contributions on the application and development of strain gauges, with photoelasticity as a close second. In the second decade of *Strain*, the number of contributions dropped from 210 to 159 with the main contributions once again photoelasticity and strain gauge applications. In the decade 1985–1994, techniques such as holography emerged, and there were six contributions on finite element analysis. Still of the 160 contributions, 63 were on strain gauges. In the decade running up to *Strain's* 40th anniversary, 159 papers were published with special

issues on new techniques such as thermoelastic stress analysis and optical fibre sensors. The pages of *Strain* also included news about BSSM, new product guides and, on one occasion, a crossword.

In May 2000, I took over as Editor in Chief of *Strain*; at that time, *Strain* had a dual purpose as the BSSM newsletter and publishing of peer-reviewed technical papers. It was still produced in house and managed in the same way as it was in 1964. In the face of the online publishing revolution, the BSSM realised that for *Strain* to survive as a learned journal, some radical changes needed to be made. It was decided that *Strain* should be published by a scientific publishing house, and following negotiations throughout 2001, a contract was agreed with Blackwell Publishing (now Wiley). The first Wiley edition of *Strain* appeared in 2002 with a new design of front cover. This volume had 169 pages and appeared as four issues, with papers on photoelasticity, thermoelastic stress analysis, acoustic emission and shearography, to name a few. It is clear from this volume that the field of experimental mechanics was diversifying thanks to the ever increasing computational power enabling faster and more plentiful data acquisition and the improvements in sensors particularly charge-coupled devices and complementary metal-oxide-semiconductor devices to enable digital imaging in a way we could have never imagined a decade previously.

The most important development for *Strain* following the publication agreement with Wiley was its inclusion on the Institute for Scientific Information index and, for the first time ever, having an impact factor. The journal was yet to be published online, but this followed very quickly. We were fortunate to have a strong and committed editorial board who promoted and helped grow the journal. In 2004, Dr Bob Mines from the University of Liverpool took over as Editor in Chief and paved the way for the launch of an online submission system in 2007. In 2006, *Strain* was given a new front cover and given the new subtitle 'an international journal for experimental mechanics'. Professor Emmanuel Gdoutos was Editor in Chief from 2007 to 2010 when the journal grew dramatically, going to six issues a year in 2008. Emmanuel was key in bringing a more European flavour to the journal, and the journal became the official journal of the European Society for Experimental Mechanics, as well as being the BSSM journal. In 2011, paper flow had grown to such an extent that two supplementary issues were published, the first sponsored by BSSM. The present editor, Professor Fabrice Pierron, from the University of Southampton took over as Editor

in Chief in 2011, with a mission to build on the efforts of the previous editors and to raise the overall quality of the published papers to even higher standards. To aid in the endeavour, two associate editors were appointed, Professor Ole Thybo Thomsen from Aalborg University in Denmark and myself. Ole stood down in 2012 and was replaced by Professor Josef Eberhardsteiner from Vienna University of Technology.

Over the past decade, *Strain* has clearly matured from a society journal to an internationally leading publication in the world of solid and structural mechanics. To compare and contrast with the previous study described in [1], a similar compilation of the types of papers published in *Strain* over the past decade is provided in Table 1. Here, the approach was to use some of the headings used in [1], that is, PE, photoelasticity; SG, strain gauges; XR, X-ray (in Table 1, this also includes neutron-based techniques); M, moiré interferometry; FE, finite element analysis; and FFM, fatigue and fracture mechanics. Table 1 also includes techniques based on infrared thermography (IR), kinematic techniques that use white light illumination (WL), interferometric techniques to include digital speckle pattern interferometry and holography (I), sensors and signal processing (SSP) and others (O). How the papers are categorised is somewhat subjective, but in the main, it is done by the major subject area. Table 1 gives also the total number of papers per volume (TOT) and the printed pages (PP). The count does not include editorials, news items and other such material. It was also decided not to include the two 'bumper' supplements as this significantly distorts the data for the 2011 volume.

The first item to note in Table 1 is the increase in issues in 2008 and the subsequent increase in papers. Notwithstanding this, one can observe a steady growth in papers. More interesting is the profile of the papers with most topics showing a steady turnover, with a slight

decline in photoelasticity. Most marked is the increase in papers for the white light topic; these are primarily papers on digital image correlation with the submissions showing the increased interest in this technique from both an applications point of view as well as error analyses and algorithm development. In 2009, it was clear that there was a significant increase in the papers defined as 'others'; these included microscale and nanoscale testing methodologies as well as destructive residual stress analysis and general mechanical testing as its main constituents. The interesting feature here is the growth in novel techniques that do not fit the general headings of white light, infrared thermography, photoelasticity or interferometry. It should also be mentioned that Strain gauges are now standard instrumentation for most researchers in experimental mechanics and no well-equipped laboratory would be without them. It is interesting to note that the majority of papers on strain gauges in the last decade covered embedded gauges, which is still a developing area for 3D strain analysis. To summarise, there is a healthy level of activity in experimental mechanics in general revitalised by the use of imaging approaches. The future will see more work using X-ray and other tomographic techniques to elicit interior strains and the development of high-speed imaging systems to capture the strain fields generated in high rate events. The growth in the capability of the techniques is strongly technology driven; hence, we can recognise a trend that is shared with many other scientific areas. The goal is to understand better the factors that affect structural performance; hence, residual stress is a hot topic, with more researchers looking towards full-field approaches. Materials characterisation studies in soft matter and heterogeneous materials necessitate the non contact nature of imaging. The future is rich in extraordinary challenges with many problems to solve and methodologies to develop.

Table 1: Spread of topic in *Strain* over the last decade (2004–2013)

	IR	PE	WL	I	SG	XR	M	FE	SSP	FFM	O	TOT	PP
2004	2	3		2	1			1	5	1	6	21	219
2005		2	1		5	1	1	1	6	2	2	21	216
2006		4	6	2	4		1	1	5	2	4	29	319
2007		2	3	1	3		1	1	4	2	5	22	357
2008	4	2	7	13	2			1	4	6	13	52	481
2009	3	1	6	2	1		1	1	3	9	27	54	553
2010	3	2	10	8	1	3		2	1	4	20	54	600
2011	1	1	3	2	1		1	4	5	5	35	58	555*
2012	1		17		2	1		4	6	8	18	57	538
2013	2	1	13	3	3	2		1	1	3	20	48	551

*Not including papers in the two supplementary issues totalling 1062 pages.

In 2011, *Strain* was published as online only, clearly as an academic journal, publishing leading edge research. Much of the applications aspects and aspirations of the founders has been replaced with novel techniques, sensors and testing methods. The BSSM has replaced the application aspect with regular seminars, workshops and courses to take the research to industry, hence maintaining the original concept of the BSSM.

In a final note, I would like to thank all my colleagues who have contributed to BSSM and *Strain* for providing a rich and open environment in which to exchange ideas and develop new research collaborations. Involvement in the BSSM and *Strain* has kept me busy over the past 15 years; it has been an honour and a delight to be involved.

Reference

1. Stanley, P. (2004) 40 years of strain: a retrospective review. *Strain* **40**, 95–101.



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