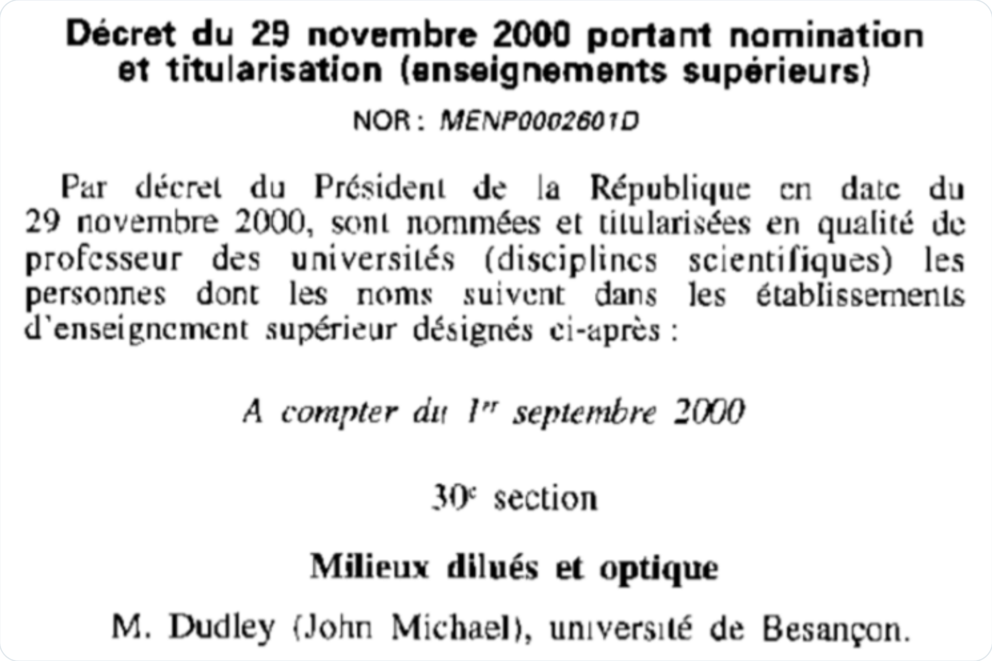
John Dudley @johnmdudley

Aug 28, 2020 • 31 tweets • johnmdudley/status/1299296135526461440

An important anniversary next week! 20 years since I left @UoA_Physics in beautiful Aotearoa to live in beautiful Besançon. In the best academic tradition, must be time for a 20 year Activity Report! Thread follows: @fc_univ @FemtoSt @INSIS_CNRS @CNRS_Centre_Est



Décret du 29 novembre 2000 portant nomination et titularisation (enseignements supérieurs)

NOR : *MENP0002601D*

Par décret du Président de la République en date du 29 novembre 2000, sont nommées et titularisées en qualité de professeur des universités (disciplines scientifiques) les personnes dont les noms suivent dans les établissements d'enseignement supérieur désignés ci-après :

A compter du 1er septembre 2000

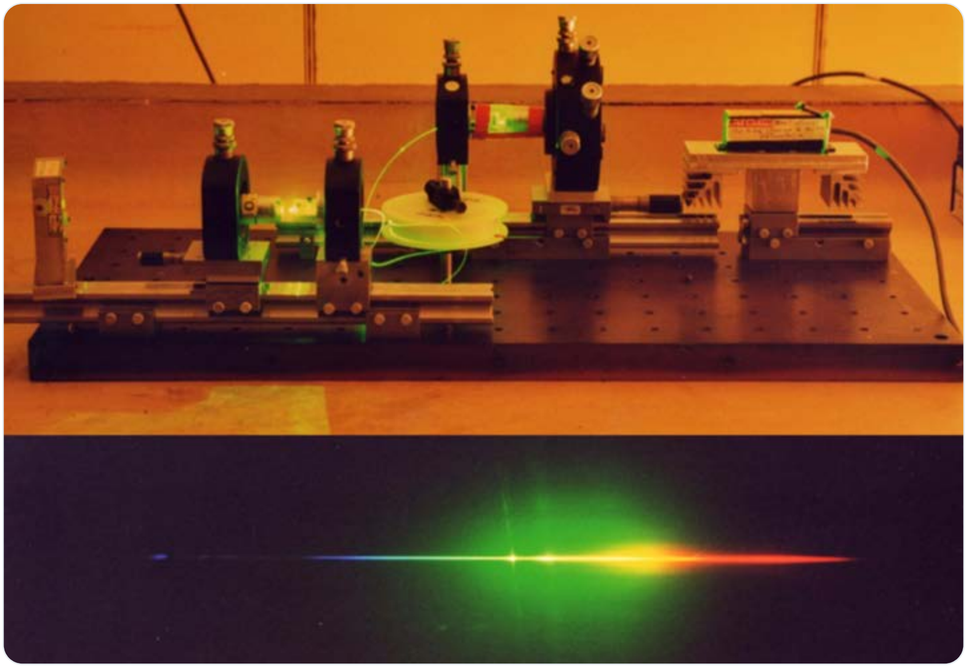
30e section

Milieux dilués et optique

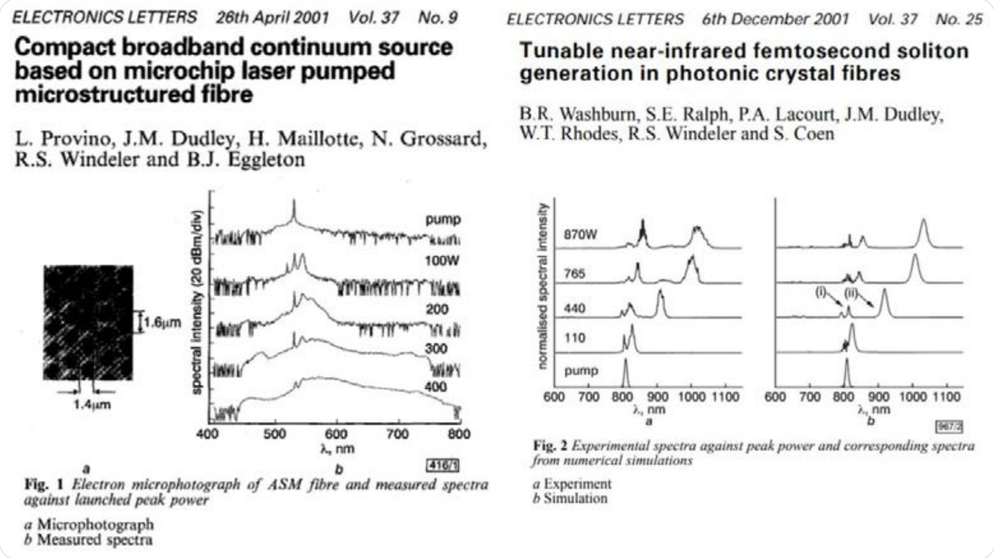
M. Dudley (John Michael), université de Besançon.

Important caveat. Don't believe for a second that everything ran smoothly! Many failures - rejected papers & funding, most ideas went nowhere, many mistakes. But you keep at it and with LOTS of help you somehow get somewhere in the end.

2000. Arrived in August with only 4 weeks' notice of classes to teach! Fitted in 3 days at CLEO Europe in September to hear people buzzing about something called PCF supercontinuum. Found lab space, @ProfBenEggleton magicked the fibre, and started to see what the fuss was about.



2001. With Laurent Provino & Hervé Maillotte, we saw a nanosecond supercontinuum & with Stephane Coen, studied the femtosecond regime as well. In the long-gone wonderful days of pre-impact factor obsession, publishing quickly in Electronics Letters was the way to go!



ELECTRONICS LETTERS 26th April 2001 Vol. 37 No. 9

Compact broadband continuum source based on microchip laser pumped microstructured fibre

L. Provino, J.M. Dudley, H. Maillotte, N. Grossard, R.S. Windeler and B.J. Eggleton

Fig. 1 *Electron microphotograph of ASM fibre and measured spectra against launched peak power*

a Microphotograph
b Measured spectra

ELECTRONICS LETTERS 6th December 2001 Vol. 37 No. 25

Tunable near-infrared femtosecond soliton generation in photonic crystal fibres

B.R. Washburn, S.E. Ralph, P.A. Lacourt, J.M. Dudley, W.T. Rhodes, R.S. Windeler and S. Coen

Fig. 2 *Experimental spectra against peak power and corresponding spectra from numerical simulations*

a Experiment
b Simulation

2002. By quantifying spectral coherence, modelling explained the pulse-duration dependence of supercontinuum stability, an important result at the time. Also had a lot of fun with @libroraptor writing about the history of refraction in @PhysicsWorld

Coherence properties of supercontinuum spectra generated in photonic crystal and tapered optical fibers

John M. Dudley

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Stéphane Coen

Service d'Optique et Acoustique, Université Libre de Bruxelles, Avenue F. D. Roosevelt 50, CP 194/5, B-1050 Brussels, Belgium

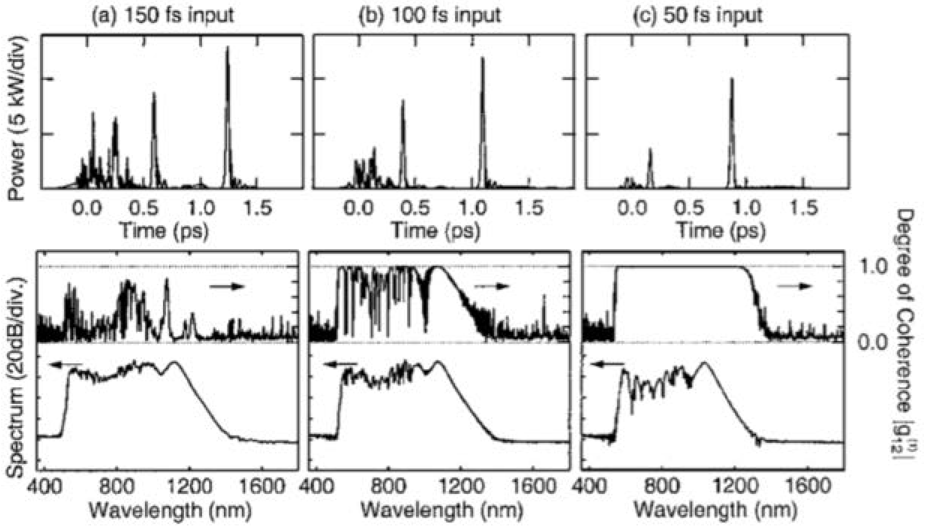


Fig. 3. For input pulse durations of (a) 150 fs, (b) 100 fs, and (c) 50 fs the top curves show the output temporal intensity from one simulation and the bottom curves show the mean spectrum (left axis) and the degree of coherence (right axis) calculated from an ensemble average.

LATERAL THOUGHTS: ALISTAIR KWAN, JOHN DUDLEY AND ERIC LANTZ

Who really discovered Snell's law?

Open any physics textbook and you'll soon come across what English-speaking physicists refer to as "Snell's law". The principle of refraction – familiar to anyone who has dabbled in optics – is named after the Dutch scientist Willebrord Snell (1591–1626), who first stated the law in a manuscript in 1621. In French, however, the same law is often called "la loi de Descartes" because it was René Descartes (1596–1650) who first put the law into widespread circulation in his *Discourse on Method*, published in 1637.

Indeed, Descartes not only stated the law, but also explained and derived it by considering how light would behave if it were made of particles. He even used the law to derive the hyperbolic form of perfect lenses that can focus incoming parallel rays to a single point. With this calculation, Descartes fulfilled what had been a 2000-year search for a perfectly focusing lens or "burning glass" – otherwise known as an "anaclastic".

But the origin of this search can be traced back to the ancient Greeks, who were among the first to use lenses to light fires. In *The Clouds*, for example, Aristophanes suggests that solar rays can be focused by a lens to erase the records of financial debts recorded on wax tablets. Rome's vestal virgins, meanwhile, would use burning glasses to ceremonially re-kindle their sacred fire with a pure flame drawn from the Sun, untainted by Earthly dross. The Sun's rays can also be focused with concave mirrors, which came to be known as *speculi ustori* – cremators' mirrors – for their ability to light funeral pyres. They could even be used to light pyres for the living, as Archimedes (c287–212 BC) is said to have demonstrated to Roman soldiers besieging the Greek colony at Syracuse.

Surprisingly, however, the point where the reflected rays converge and burn was not named by the Romans – even though they must surely have noticed it. We owe our name for this "burning point" to Johannes Kepler (1571–1630), who carried out extensive research into reflecting and refracting surfaces a few decades before Snell and Descartes. Kepler named the burning point a "fireplace", which, in Latin, gives us the word "focus".

Kepler's work on burning glasses, however, was only moderately successful, lacking as he did the required sine law of refraction to determine the shape of refracting surfaces. Kepler certainly tried to obtain the law, after the English mathematician and astronomer Thomas Harriot (1560–1621) let it slip that he knew it. Indeed, Harriot knew the law as early as 1602, long before either Snell or Descartes. But when Kepler asked for the law, Harriot merely sent him some precisely computed tables of data, lamenting that ill health prevented him from putting it explicitly into a form suitable for publication.

As Harriot's health ebbed, so did Kepler's patience. Waiting no more, Kepler improvised. He observed that when light rays are close to the axis of a lens, the angles of incidence and refraction (rather than the sines of the angles) are proportional to one another, with the multiplier depending on the medium between which the light passes. Applying this approximation first to lenses and then to lens-based instruments, Kepler produced a theoretical approach so effective that his method and diagrams are reproduced, almost unchanged, in optics textbooks today.

Although Kepler's treatment succeeded in describing the refraction of rays close to the optical axis, it was still an approximation – and could thus never have led him to the elusive anaclastics that science had long sought. What is interesting, however, is that Kepler had previously written a text on astronomical optics, expanding on a book written by the Polish scholar Witelo (1250–1275) some four centuries earlier. Witelo's text was bound in with a printed edition of the *Opticae Thesaurus* – his translation of an optics textbook by the Islamic scholar Abu Ali al-Hasan Ibn al-Haytham (965–1040), who is more commonly known by his Latinized name of Alhazen.

There is no doubt that Ibn Sahl understood the sine law of refraction

Ibn al-Haytham was influential in Europe for several centuries, with virtually all European optics from the Middle Ages to the Renaissance building on his work. One work that he translated was *Optics* by Ptolemy of Alexandria (c150), which contains Ptolemy's studies of refraction at air–glass and air–water boundaries. However, Ptolemy's results were obtained not by measurement – as he presented them – but by calculation, using an incorrect quadratic "law" of refraction.

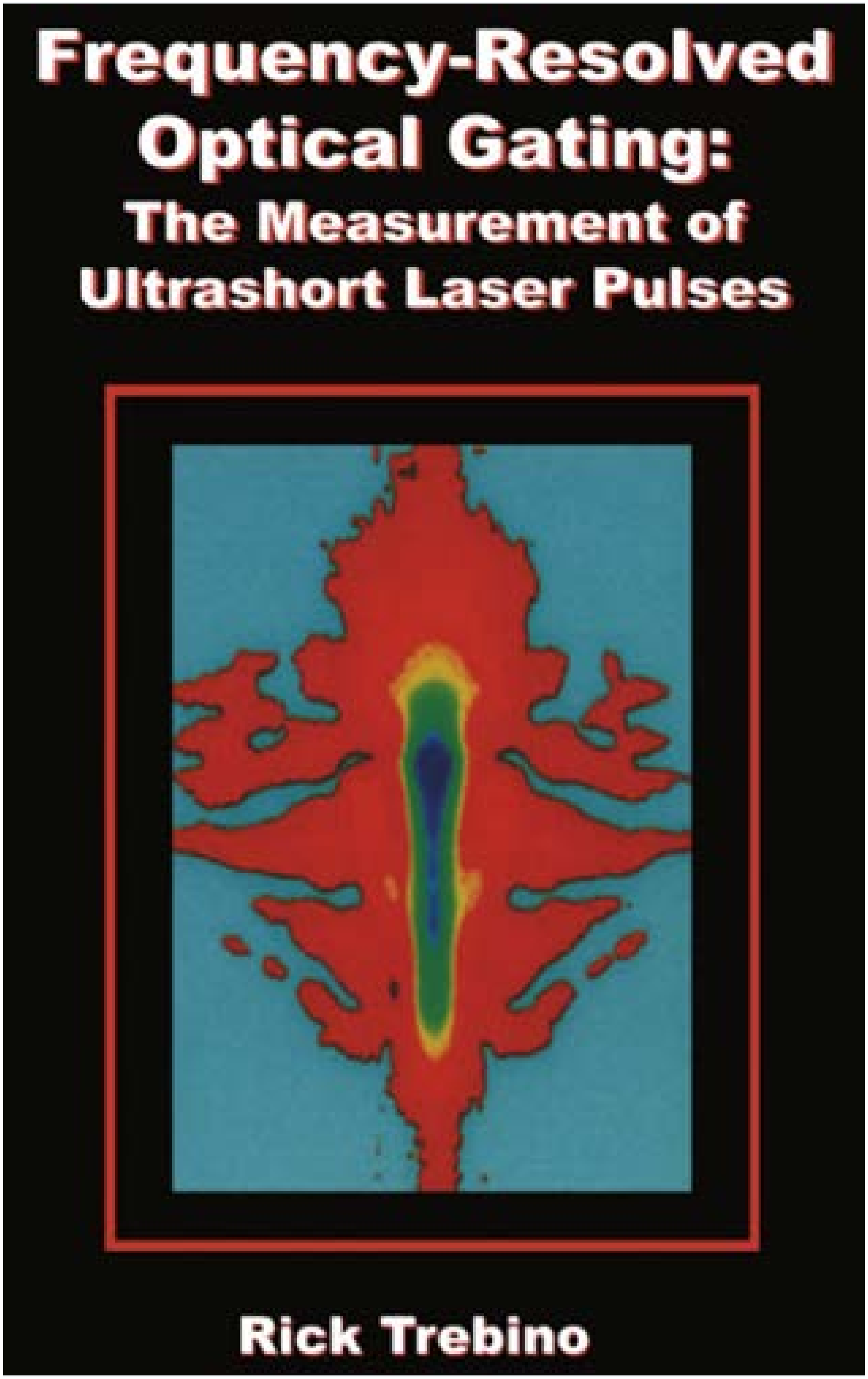
But because Ibn al-Haytham accepted this part of the book, Ptolemy's error was perpetuated for a further 600 years. Worse still is the fact that Ibn al-Haytham had actually seen the correct sine law of refraction when he translated *On the Burning Instruments*, written in about 984 by the mathematician Abu Said al-Ala Ibn Sahl. The latter makes clear reference to Ptolemy's *Optics*, rejects the erroneous law of refraction found therein, states the current law (in much the same terms as Harriot) and then goes on to compute, with purely theoretical interests, the anaclastics that Descartes thought were his own.

Based on a recent analysis of Ibn Sahl's work by the French scholar Roshdi Rashed, there is no doubt that Ibn Sahl correctly understood the sine law of refraction and that he should be acknowledged as its originator. From the viewpoint of modern physics, it is regrettable that his contributions were lost for so long, but this is certainly not the only historical triumph of falsity over perfectly correct theory. Perhaps the next question to ask is why science sometimes makes such regressive choices.

Alistair Kwan is in the Department of History and Philosophy of Science, University of Melbourne, Australia. **John Dudley** and **Eric Lantz** are in the Laboratoire d'Optique P M Duffieux, Université de Franche-Comté, France, e-mail john.dudley@univ-fcomte.fr

64 physicsweb.org Physics World April 2002

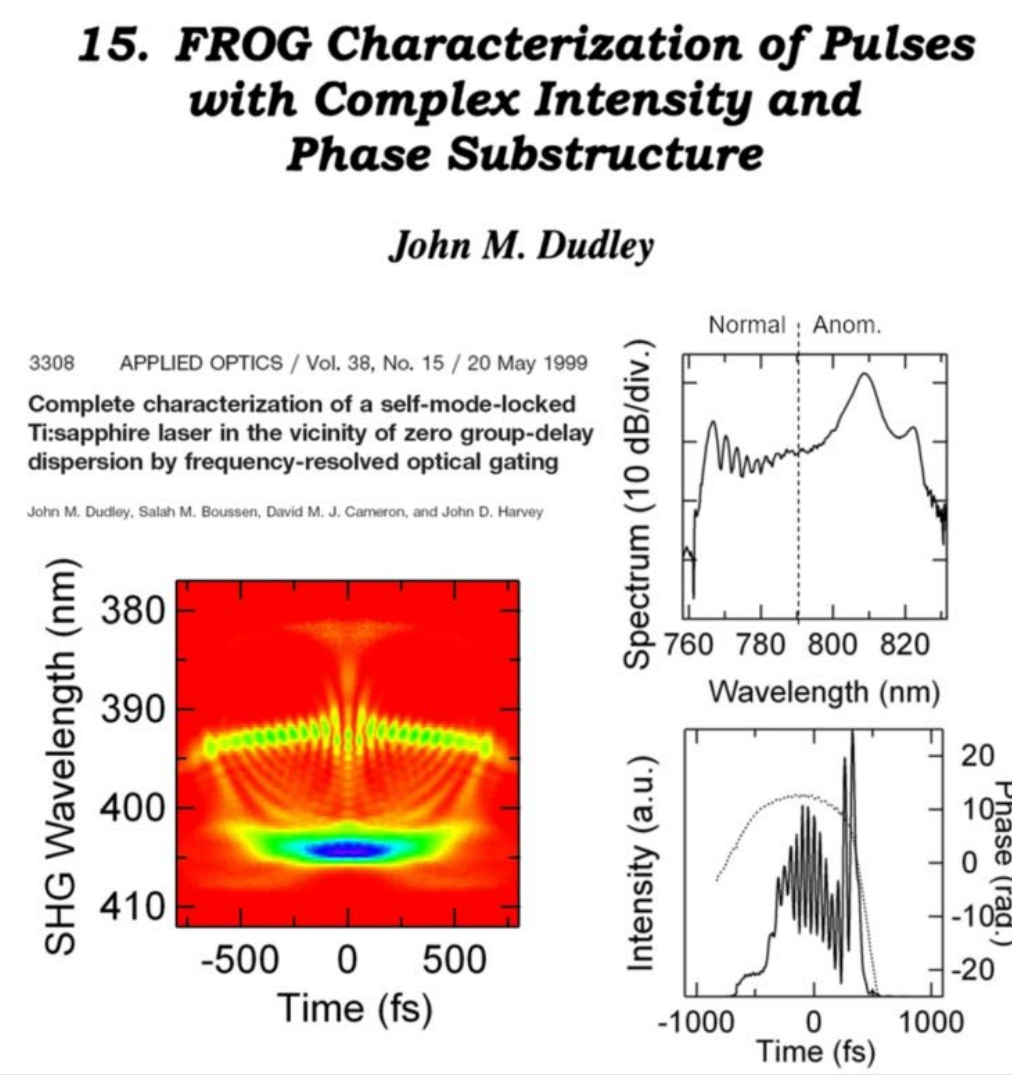
2002. Rick Trebino's book gave me the chance to revisit some complex TiS laser FROG results which had been rejected many times until appearing (& getting lost) in Appl. Opt. Too early to be interesting? Today we might call these ZDW-spanning supercontinuum dissipative solitons!



Frequency-Resolved Optical Gating:

The Measurement of Ultrashort Laser Pulses

Rick Trebino



15. FROG Characterization of Pulses with Complex Intensity and Phase Substructure

John M. Dudley

3308 APPLIED OPTICS / Vol. 38, No. 15 / 20 May 1999

Complete characterization of a self-mode-locked Ti:sapphire laser in the vicinity of zero group-delay dispersion by frequency-resolved optical gating

John M. Dudley, Salah M. Boussen, David M. J. Cameron, and John D. Harvey

2003. But this experience with complex FROG structure came in very handy when studying the supercontinuum in the time-frequency domain. With Stephane Coen we looked at experiments by Rick Trebino, and this work ended up in @OPNmagazine Optics in 2003. Timing is everything?

Cross-correlation frequency resolved optical gating analysis of broadband continuum generation in photonic crystal fiber: simulations and experiments

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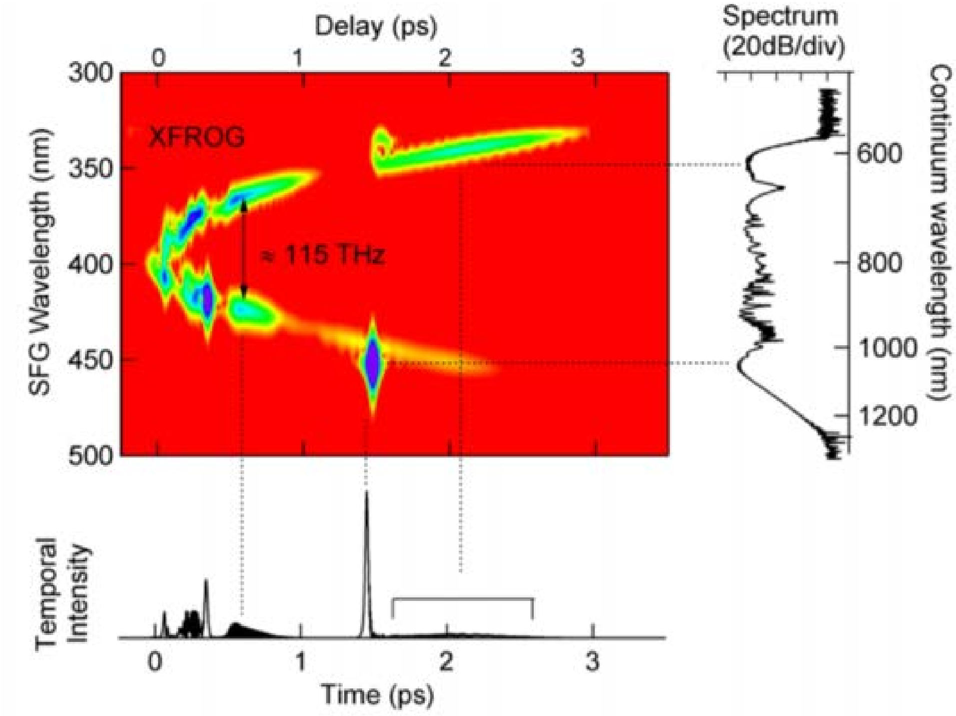

Fig. 3. (917 KB) Calculated XFROG trace with its structure correlated with the intensity and spectrum showing evolution with propagation distance. Note the nonlinear wavelength axis used in the plot of the fundamental SC spectrum.

ULTRAFAST TECHNOLOGY

ULTRAFAST TECHNOLOGY

Measuring and Understanding the Most Complex Ultrashort Pulse Ever Generated

Rick Trebino, John Dudley and Xun Gu

2004. Started working with @LaboICB during the PhD of @ChrisFINOT & co-organized a School with Guy Millot with star speakers (incl @im_sergei & @StefanWabnitz). After my talk, Philip Russell & Rick Trebino suggested the supercontinuum field needed a review. Who'd be that crazy?

Université de Bourgogne
CENTRE DE DYNAMIQUE DES SYSTEMES COMPLEXES
RTP: Composants pour les télécommunications optiques
Conseil Régional de Bourgogne
Laboratoire de Physique de l'Université de Bourgogne (LPUB)
UMR CNRS 5027
Summer School

NEW CONCEPTS IN PHOTONICS AND OPTICAL COMMUNICATIONS

June 21-25, 2004 – Dijon, France
http://eunomie.u-bourgogne.fr/POC

The intended audience for this school is PhD students, postdocs and researchers working in the fields of photonics, optical telecommunications, nonlinear optics, ultrafast phenomena, and more generally in nonlinear physics, who want to acquire knowledge on new concepts recently developed in these fields. The school will be more specifically devoted to advanced materials and photonic crystal structures, next generation systems, ultrafast sources and devices, new paradigms in photonics and next generation solitons and nonlinear waves. Both theoretical and experimental aspects will be explored.

ORGANIZING COMMITTEE

Guy MILLOT, Professor (LPUB)
John DUDLEY, Professor (LOPMD)
Stefan WABNITZ, Professor (LPUB)
Hans-Rudolf JAUSLIN, Professor (LPUB)
Secretary: **Emeline ILTIS** (E-mail: Emeline.Iltis@u-bourgogne.fr)

PROGRAMME

Photonic Crystal Fibres, **P. St. John Russell (University of Bath, UK).** The Physics of Photonic crystal, **F. Lederer (University of Jena, Germany).** Ultrashort pulse propagation in Photonic Crystal Fibres, **J. Dudley (University of Franche Comté, France).** Nanophotonics, **J. C. Weeber (University of Bourgogne, France).** Wideband transmissions,optical regeneration and Raman amplification, **S. K. Turitsyn (Aston University, UK).** Ultra-high bit rate systems, **R. Essiambre (Lucent Technologies, USA).** Advanced Modelling of NRZ Telecommunications Systems, **Y. Kodama (Ohio State University, USA).** WDM transmission systems: stakes and prospects for an historical carrier like France Télécom, **E. Pincemin (France Télécom, France).** Fiber based ultrashort pulse sources, **J. R. Taylor (Imperial College London, UK).** Ultrashort pulse characterization, **R. Trebino (Georgia Institute of Technology, USA).** Ultrafast semiconductor all-optical devices, **J. L. Oudar (LPN, France).** Quantum information processing and Quantum Cryptography, **Ph. Grangier (IOTA, France).** System experiments in Quantum Cryptography, **J. M. Merolla (GTL-CNRS, France).** Polarization attractors, **S. Pitois (University of Bourgogne, France).** Dissipative Solitons, **N. Akhmediev (Australian National University, Australia) and Ph. Grelu (University of Bourgogne).** Cavity solitons, **J. Tredicce (INL, France).** Nonlinear X Waves, **S. Trillo (University of Ferrara, Italy).** Incoherent solitons and condensation processes, **A. Picozzi, (University of Nice Sophia-Antipolis, France).** Optical Similaritons. Space-time effects, **F. Wise (Cornell University, USA) and C. Finot (University of Bourgogne).**

2005. A supercontinuum review was too much for just me & Stephane so @GGoery joined the fun! Meanwhile in the lab @FemtoSt we looked at self-similar evolution in fibres with @UniofBathSci & I still think the results below are amongst the most beautiful in nonlinear optics!

2 May 2005 / Vol. 13, No. 9 / OPTICS EXPRESS 3236

Intermediate asymptotic evolution and photonic bandgap fiber compression of optical similaritons around 1550 nm

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john.dudley@univ-fcomte.fr

N. Joly, J. C. Knight
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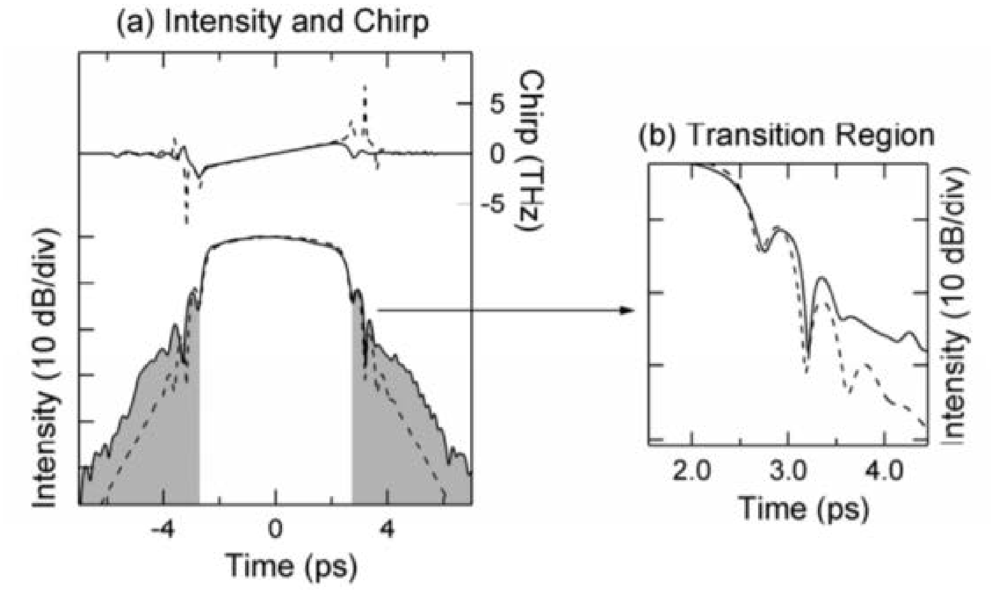
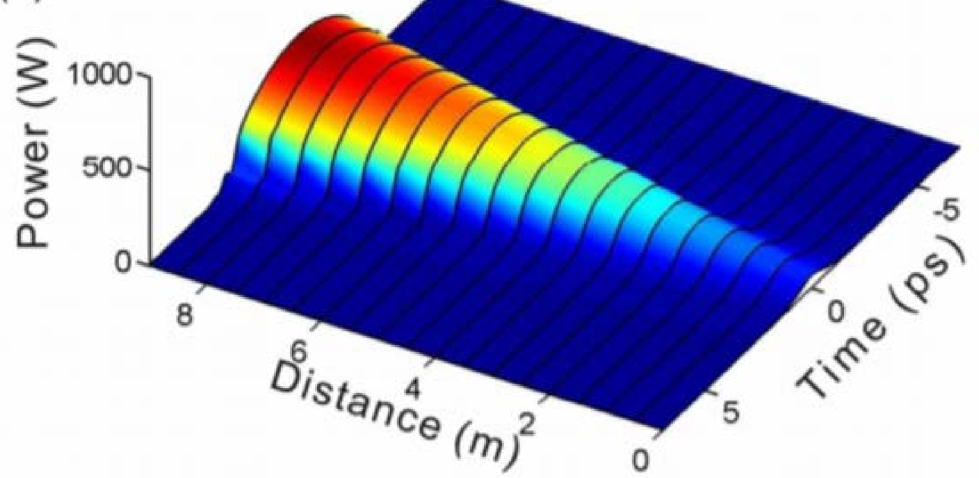
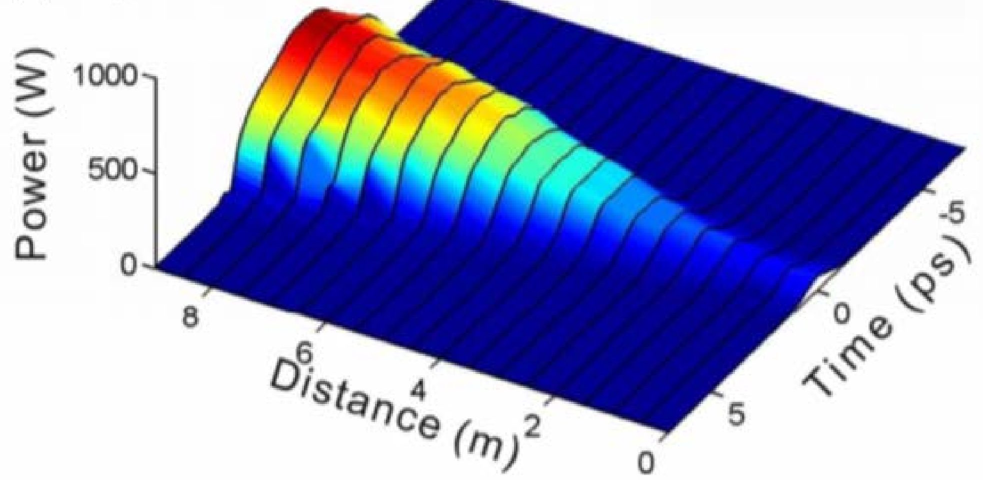


(a) Simulation



(b) Experiment



2006. After 18 months writing & review the RMP appeared in October 2006. As an aside, a very senior local colleague at the time advised me that spending so much time on just one paper was a bad career move. I learned a valuable lesson in trusting myself to ignore stupid advice!

REVIEWS OF MODERN PHYSICS, VOLUME 78, OCTOBER–DECEMBER 2006

Supercontinuum generation in photonic crystal fiber

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(Published 4 October 2006)

A topical review of numerical and experimental studies of supercontinuum generation in photonic crystal fiber is presented over the full range of experimentally reported parameters, from the femtosecond to the continuous-wave regime. Results from numerical simulations are used to discuss the temporal and spectral characteristics of the supercontinuum, and to interpret the physics of the underlying spectral broadening processes. Particular attention is given to the case of supercontinuum generation seeded by femtosecond pulses in the anomalous group velocity dispersion regime of photonic crystal fiber, where the processes of soliton fission, stimulated Raman scattering, and dispersive wave generation are reviewed in detail. The corresponding intensity and phase stability properties of the supercontinuum spectra generated under different conditions are also discussed.

DOI: 10.1103/RevModPhys.78.1135 PACS number(s): 42.65.Re, 42.65.Tg, 42.65.Ky

CONTENTS

I. INTRODUCTION

Spectral broadening and the generation of new frequency components are inherent features of nonlinear optics, and have been studied intensively since the early 1960s. A fascinating perspective on the history of this subject has been given by Bloembergen (2000). The par-

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2007. Meanwhile with very innovative modelling @GGoery showed that envelopes did not need to be "slowly varying", putting on firm foundations what people were assuming (or hoping!) was the case anyway. And a paper with @ChrisFINOT on self-similarity in @NaturePhysics

30 Apr 2007 / Vol. 15, No. 9 / OPTICS EXPRESS 5382

Nonlinear envelope equation modeling of sub-cycle dynamics and harmonic generation in nonlinear waveguides

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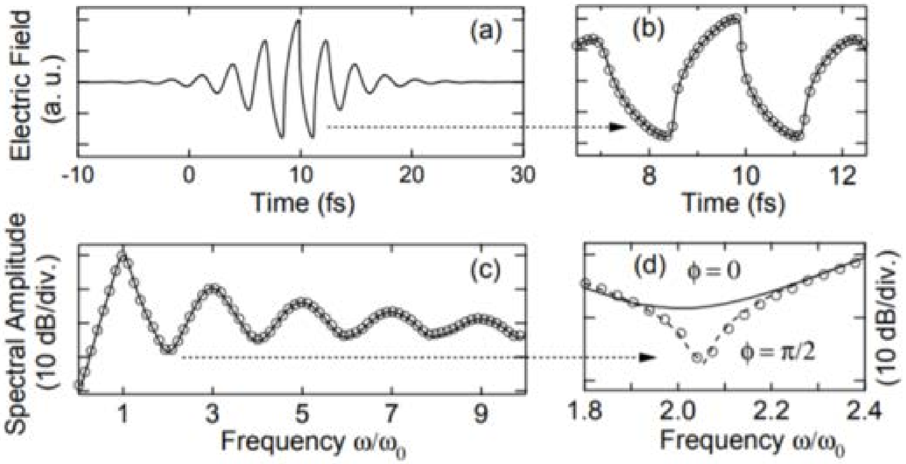

ig. 1. GNEE results neglecting dispersion. (a) Temporal feld profile and (b) detail of car er shock. (c) Spectral amplitude. Solid lines and circles show GNEE and PSSD simulatio sults respectively. (d) Detail of first spectral minima comparing results with initial CE hase set to zero (solid line) and $\pi/2$ as indicated. For the latter case, dashed lines an ircles show GNEE and PSSD simulation results respectively.

Self-similarity in ultrafast nonlinear optics

Recent developments in nonlinear optics have led to the discovery of a new class of ultrashort pulse, the 'optical similariton'. Optical similaritons arise when the interaction of nonlinearity, dispersion and gain in a high-power fibre amplifier causes the shape of an arbitrary input pulse to converge asymptotically to a pulse whose shape is self-similar. In comparison with optical solitons, which rely on a delicate balance of nonlinearity and anomalous dispersion and which can become unstable with increasing intensity, similaritons are more robust at high pulse powers. The simplicity and widespread availability of the components needed to build a self-similar amplifier capable of producing optical similaritons provides a convenient experimental platform to explore the fundamental nature of dynamical self-similarity. Here, we provide an overview of self-similar pulse propagation and scaling in optical fibre amplifiers, and their use in the development of high-power ultrafast optical sources, pulse synthesis and all-optical pulse regeneration

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Many natural phenomena exhibit self-similarity, reproducing themselves on different temporal and/or spatial scales. Although similarity and scaling laws in physics have been studied since the time of Galileo[1], their application in the modern era dates to the early years of the twentieth century, with an influential correspondence in *Nature* initiated by Lord Rayleigh[2-5] and the development of formal dimensional analysis by Buckingham[6,7]. The fundamental premise of dimensional analysis is that physical laws should be independent of the particular choice of units (be they metres, miles, furlongs or light years), and that it must be possible to express them using dimensionless parameters. Dimensional analysis is particularly powerful in reducing the number of degrees of freedom needed to describe a particular physical system, and in providing a systematic procedure to derive scaling relations between the key parameters involved. It thus provides a general technique for analysing phenomena across very different fields of physics, and even Rayleigh's brief report[2] includes a remarkable variety of examples from the resolving power of an optical microscope to the acoustic properties of the aeolian harp.

The use of scaling and normalization are common in the mathematical analysis of physical problems, but the existence of universal laws governing self-similar scale invariance in a system has a more profound fundamental significance, as it reveals the presence of internal structure and symmetry[8]. The basic concept of similar triangles is of course very familiar, but more sophisticated examples of geometrical self-similarity are widespread and can b found in settings ranging from natural branching patterns and coastlines[9], to the nodal properties of complex networks such a the World Wide Web[10].

As well as these examples involving spatial geometry, self-similarity also occurs in many dynamical problems as a natura stage in the temporal evolution of a system from a particular initia state. One of the most famous illustrations of this type concerns the evolution of the radius of a blast wave of a nuclear explosion, firs analysed by the British physicist G. I. Taylor in the 1940s[11]. Althoug a nuclear weapon is a very complex device, Taylor's insight wa to realize that the huge energy release from the explosion would result in the formation of a spherical shock wave whose self-simila expansion could be described in terms of only four dimensiona quantities: the elapsed time t, the time-dependent shock-wav radius $R(t)$, the ambient air density ρ and the energy released E.

The application of dimensional analysis to this problem seeks to combine these four quantities to form dimensionles 'similarity parameters', and it is easy to see here how they combin into one such parameter: $\theta = \rho R^5/Et^2$. It follows immediatel that the blast-wave radius expands according to the scaling la $R(t) = \theta^{1/5}(Et^2/\rho)^{1/5}$, where the similarity variable θ plays the rol of a proportionality constant. In fact, numerical computation yield a specific value for θ (approximately unity) and Taylor himself wa able to use declassified images of the 1945 Trinity explosion t quantitatively confirm this scaling hypothesis[12].

SELF-SIMILAR DYNAMICS

The blast-wave example is one where simple dimensional analysi works particularly well, but more sophisticated methods also exis to determine self-similar solutions for more complex systems Such formal similarity techniques extend the toolbox availabl to mathematical physicists, and are of particular importance i analysing nonlinear problems described by partial differentia equations — well known to be notoriously difficult to solve exactly

2008. Starting to get into serious nonlinear physics and my first paper with @LaurentLarger Also with @GGoery & @ProfBenEggleton we start getting interested in understanding if optical rogue waves are a real thing or not. We certainly found "rogue solitons"!

CHAOS **18**, 013110 (2008)

Experimental chaotic map generated by picosecond laser pulse-seeded electro-optic nonlinear delay dynamics

Mélanie Grapinet,[1] Vladimir Udaltsov,[1,2] Maxime Jacquot,[1] Pierre-Ambroise Lacourt,[1]
John M. Dudley,[1] and Laurent Larger[1,a)]
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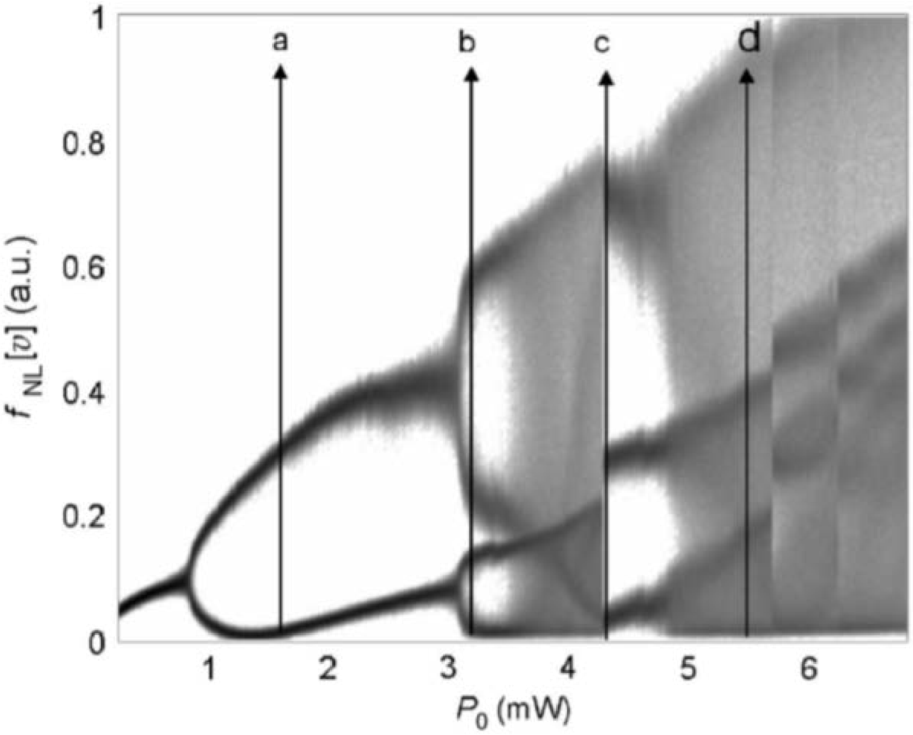
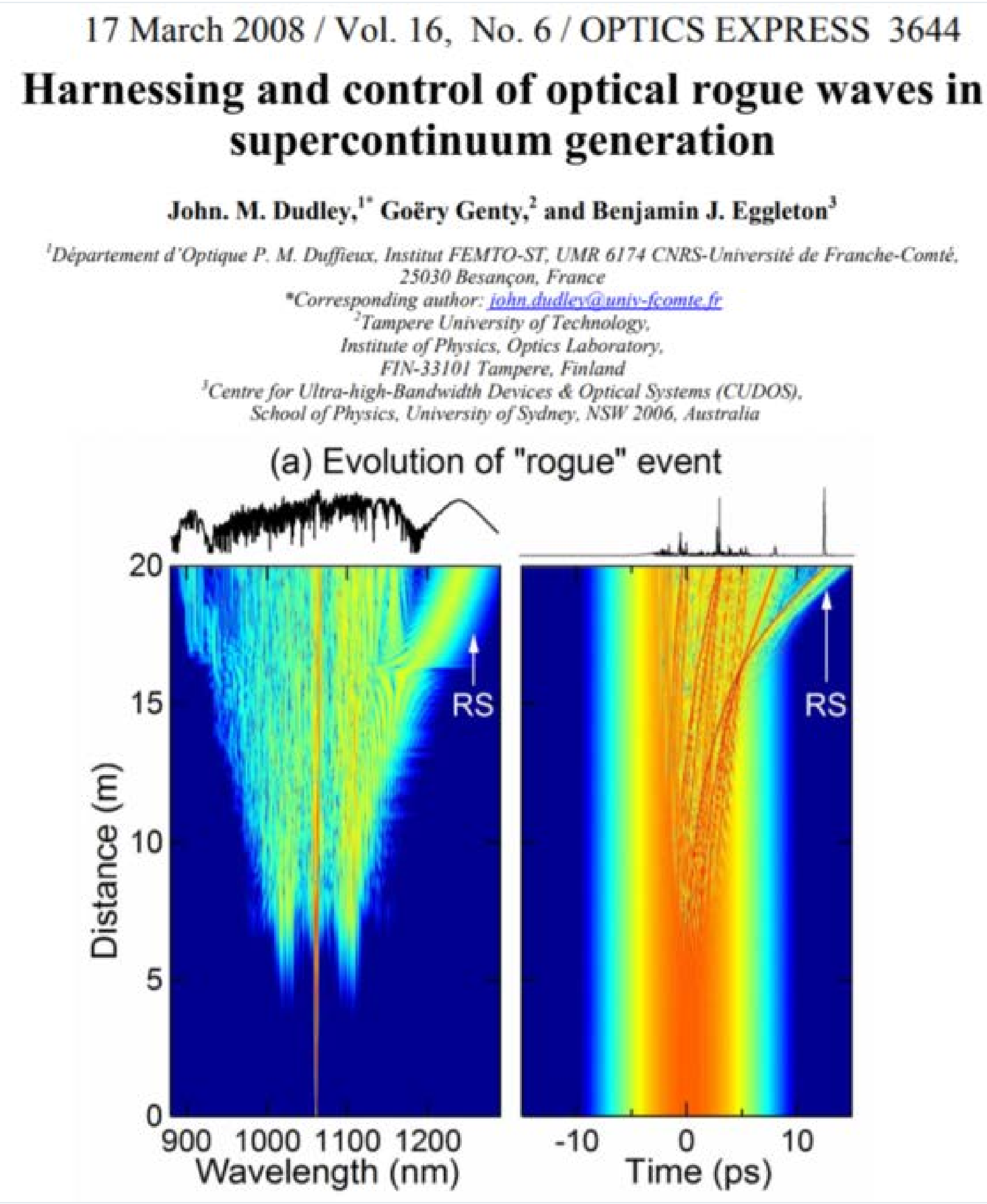


FIG. 4. Experimental bifurcation diagram for $V_0=4.3$ V ($\Phi_0=1.5$ rad).



17 March 2008 / Vol. 16, No. 6 / OPTICS EXPRESS 3644

Harnessing and control of optical rogue waves in supercontinuum generation

John. M. Dudley,[1*] Goëry Genty,[2] and Benjamin J. Eggleton[3]

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**Corresponding author: john.dudley@univ-fcomte.fr*
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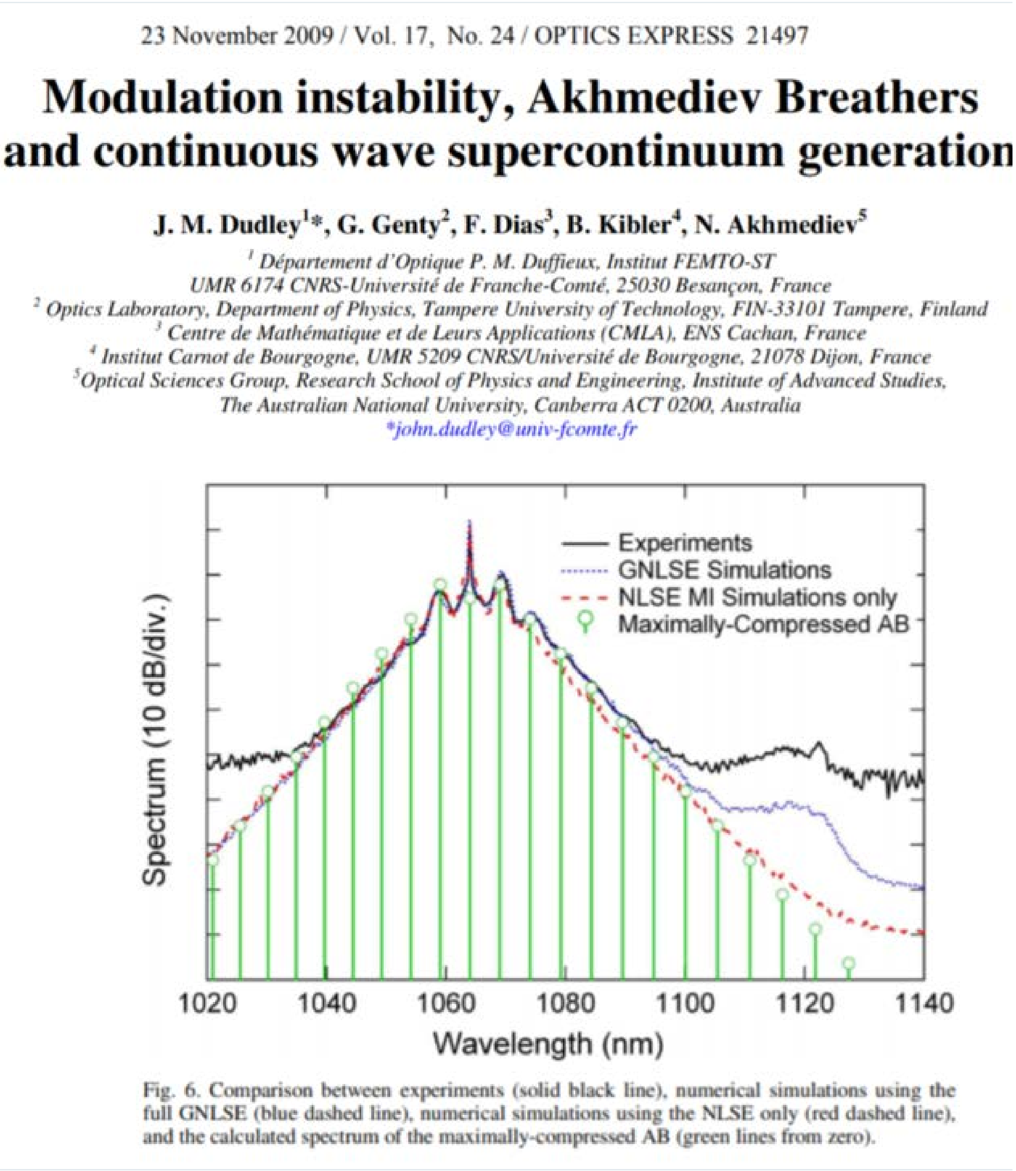
FIN-33101 Tampere, Finland
[3]Centre for Ultra-high-Bandwidth Devices & Optical Systems (CUDOS),
School of Physics, University of Sydney, NSW 2006, Australia

2009. After a beverage with @GGoery & Nail Akhmediev in Munich, we unravelled the natural (in hindsight obvious) link between breathers, modulation instability & supercontinuum. With input from @FredericDiasUCD & experiments from Bertrand Kibler, it all fitted beautifully!



23 November 2009 / Vol. 17, No. 24 / OPTICS EXPRESS 21497

Modulation instability, Akhmediev Breathers and continuous wave supercontinuum generation

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Fig. 6. Comparison between experiments (solid black line), numerical simulations using the full GNLSE (blue dashed line), numerical simulations using the NLSE only (red dashed line), and the calculated spectrum of the maximally-compressed AB (green lines from zero).

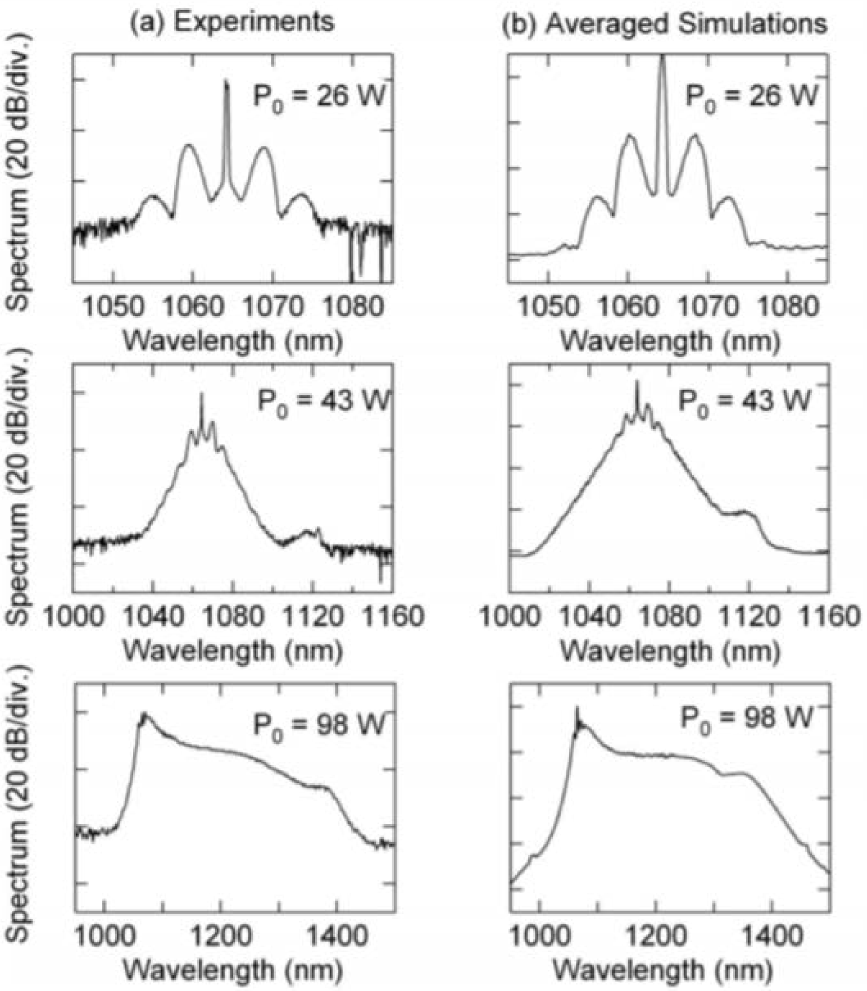
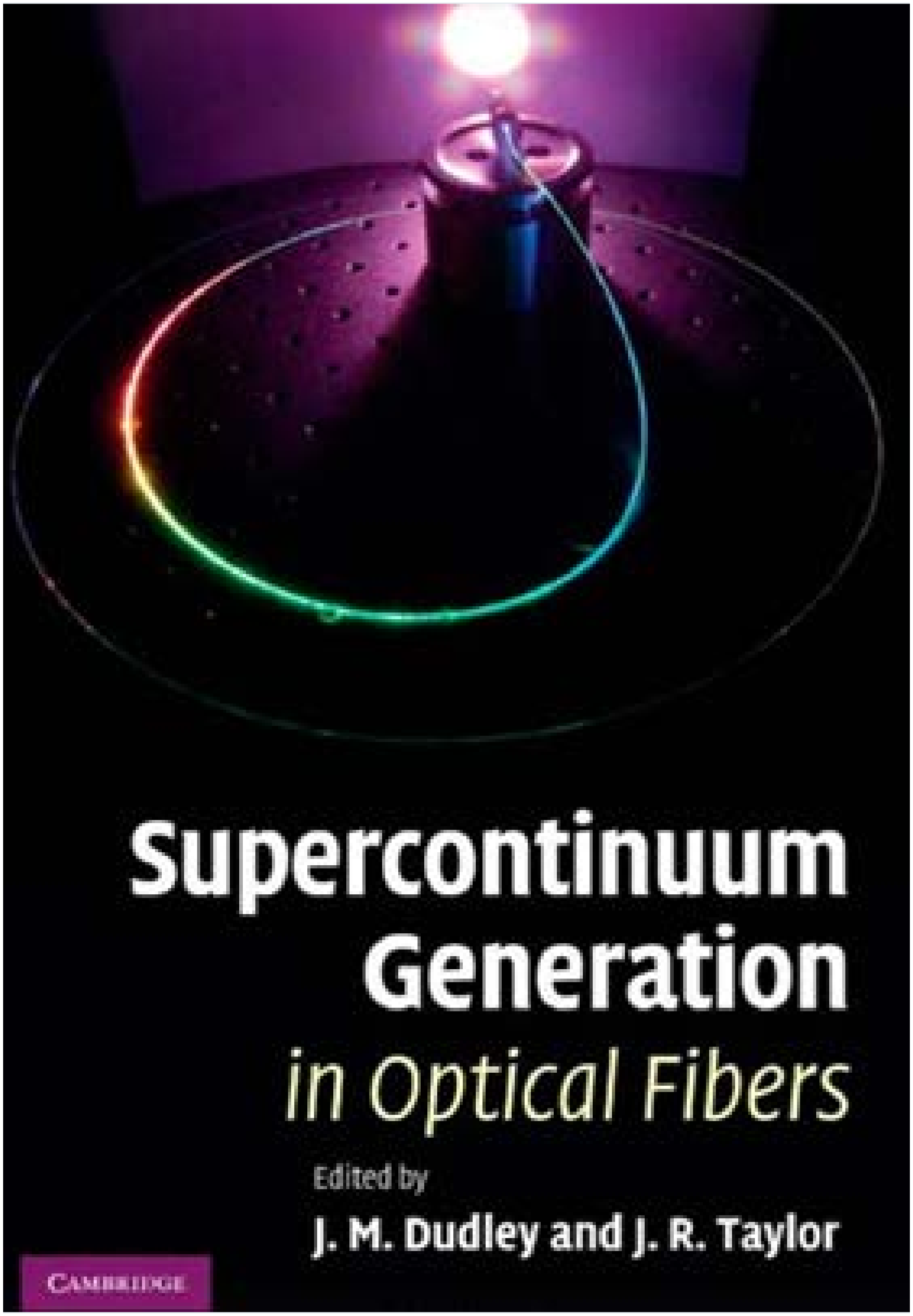


Fig. 3. Experimental (left) and simulation (right) results for 1 ns pulses at 1064 nm injected into highly nonlinear PCF at peak powers as shown. Simulation results are averaged and convolved with a spectral resolution function matching the bandwidth of the spectrum analyzer used in the experiments (0.1 nm for 26 W results; 0.4 nm for 43 W results; 1.6 nm for 98 W results).

2010. Busy year. A book with the great Roy Taylor (includes chapters by @jctravs and many others) & lots of rogue waves, especially the Peregrine Soliton seen by Bertrand Kibler after we designed the experiment on the Besancon-Dijon TER! With @ChrisFINOT @FredericDiasUCD @GGoery

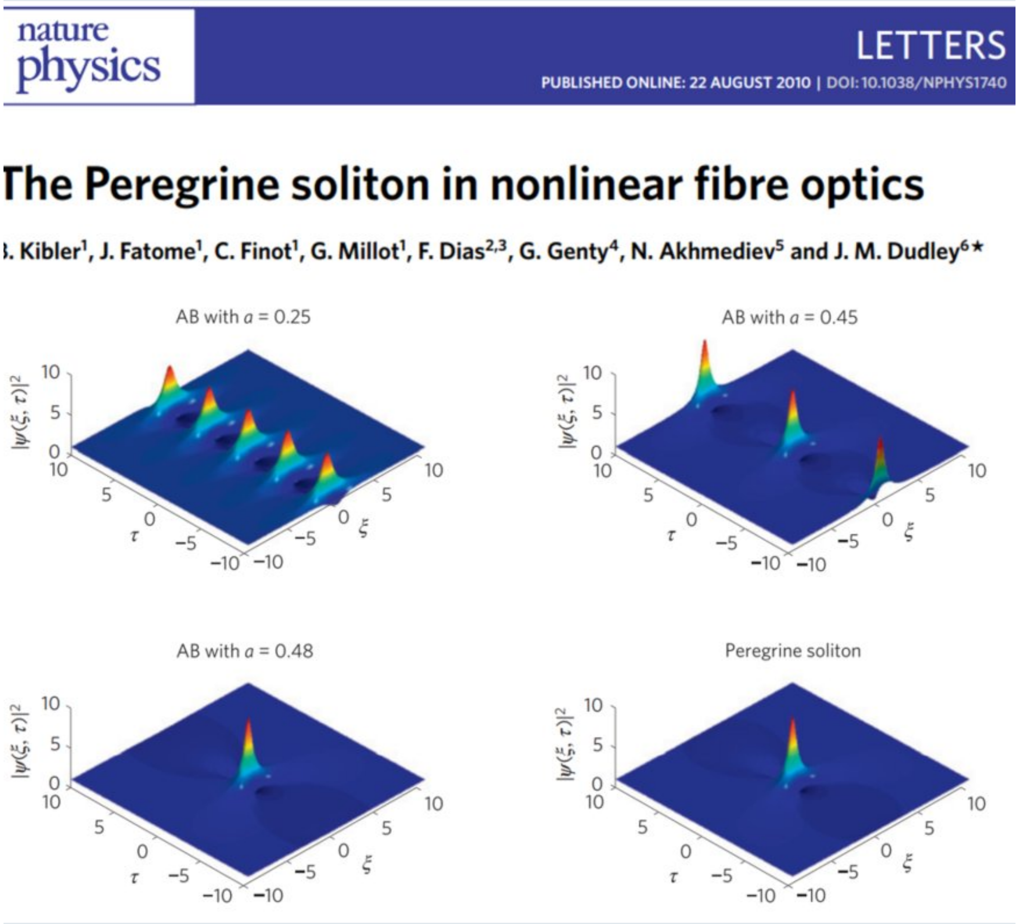


Supercontinuum Generation
in Optical Fibers

Edited by

J. M. Dudley and J. R. Taylor

CAMBRIDGE



nature physics

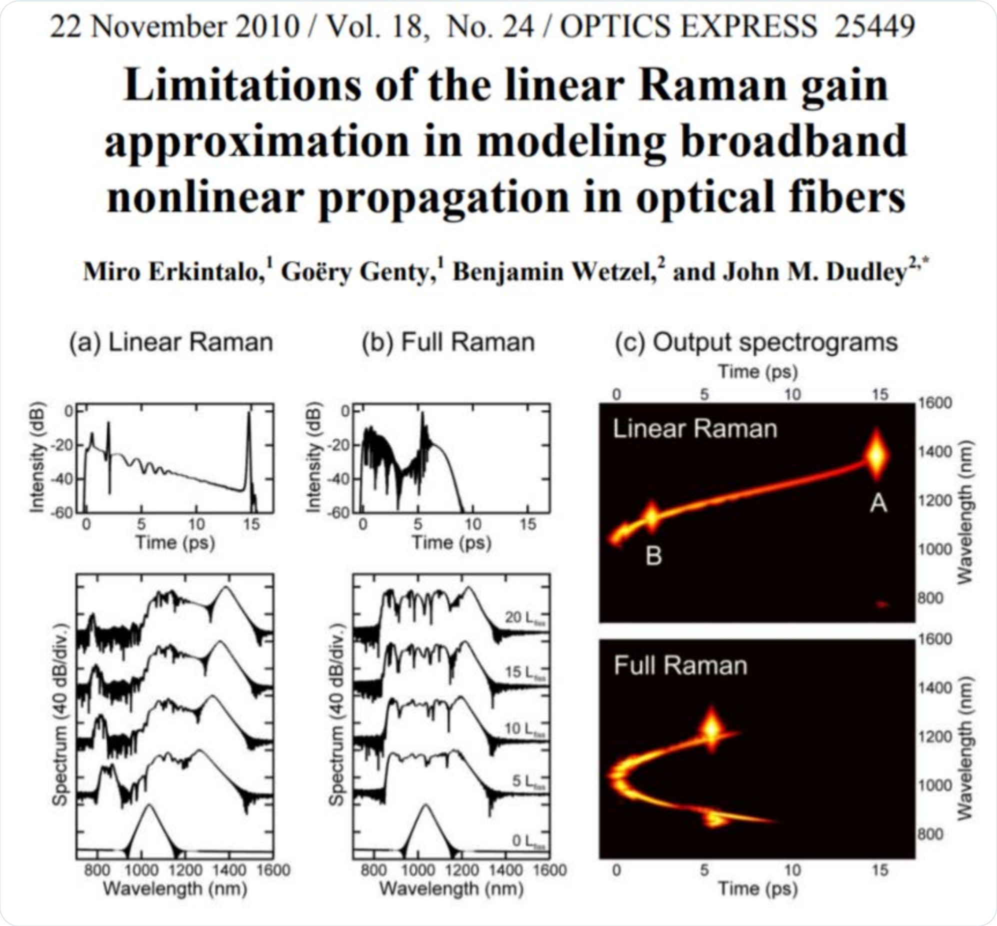
LETTERS

PUBLISHED ONLINE: 22 AUGUST 2010 | DOI:10.1038/NPHYS1740

The Peregrine soliton in nonlinear fibre optics

. Kibler[1], J. Fatome[1], C. Finot[1], G. Millot[1], F. Dias[2,3], G. Genty[4], N. Akhmediev[5] and J. M. Dudley[6]*

2010. Also a paper with [@MErkintalo](#) and [@Benj_Wetzel](#) which has flown under the radar a bit, but describes some limits that are absolutely crucial to understand if you want to avoid errors. If you model supercontinuum read this right now!
https://www.osapublishing.org/oe/abstract.cfm?uri=oe-18-24-25449



22 November 2010 / Vol. 18, No. 24 / OPTICS EXPRESS 25449

Limitations of the linear Raman gain approximation in modeling broadband nonlinear propagation in optical fibers

Miro Erkintalo,[1] Goëry Genty,[1] Benjamin Wetzel,[2] and John M. Dudley[2,*]

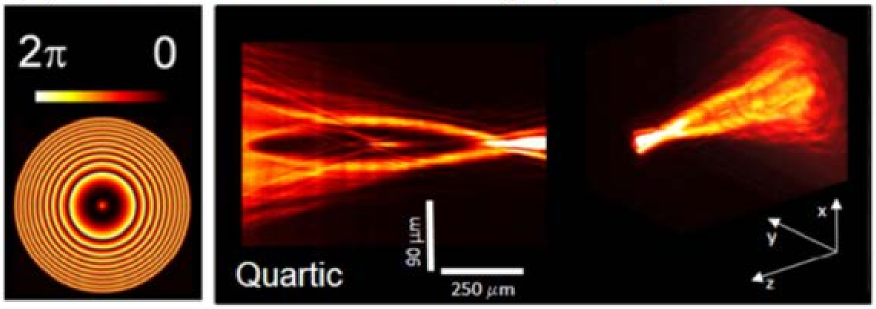
2011. Having fun at @FemtoSt with Francois Courvoisier & Luc Froehly studying accelerating beams (results below are experimental btw!) And still uncovering subtleties in modulation instability experiments with @MErkintalo & @kh_ubfc using serious maths (Darboux transformation)

15 August 2011 / Vol. 19, No. 17 / OPTICS EXPRESS 16455

Arbitrary accelerating micron-scale caustic beams in two and three dimensions

**L. Froehly, F. Courvoisier, A. Mathis, M. Jacquot, L. Furfaro,
R. Giust, P. A. Lacourt, J. M. Dudley**[*]

(a) Circular caustic beam – tomographic representation



(b) Spiral caustic beam – tomographic representation

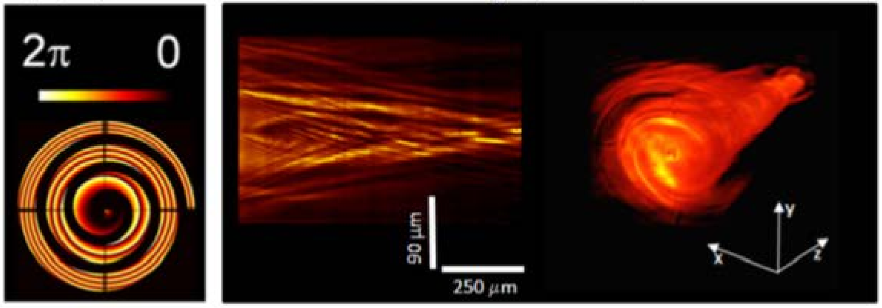


Fig. 6. Combining an engineered acceleration trajectory with (a) rotational symmetry and (b) an imposed spiral structure. The left panels show the applied phase profiles; the right panels show tomographic representations of the shaped fields in both cases as discussed in the text.

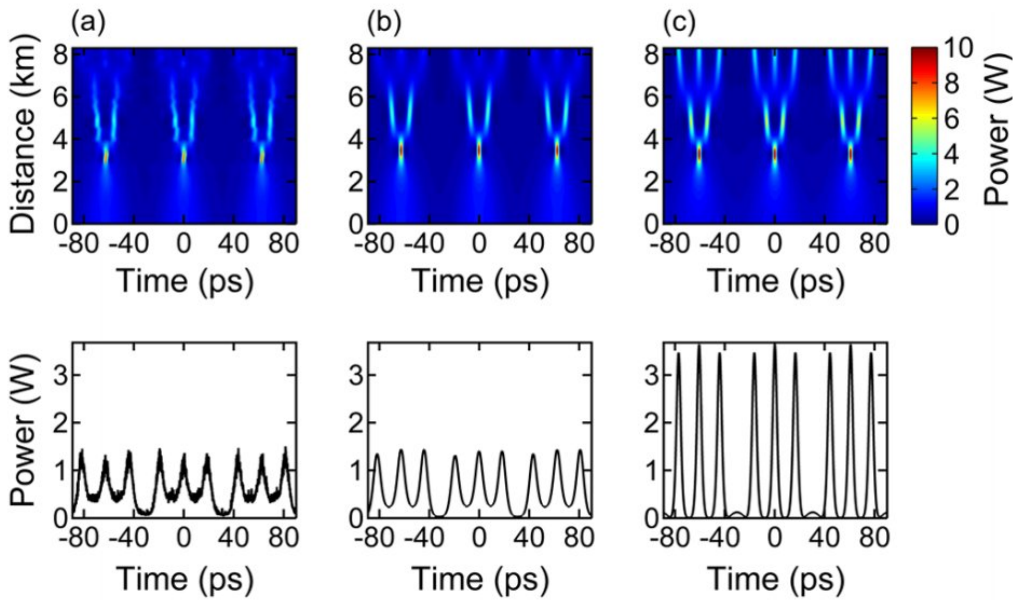


FIG. 3 (color online). Top: Spatiotemporal evolution of cw modulated field for $a = 0.464$. Bottom: Temporal profile at a distance of 8.34 km. (a) Experiments, (b) NLSE simulation, and (c) analytical solution from the Darboux transformation.

2011. Kicking off the idea of an International Year of Light at a wonderful @EuroPhysSoc and @SIF_it event in Varenna. Also met @joeniemela & other dignitaries for the first time! More background on the beginnings of the Year of Light initiative here:

United Nations
Educational, Scientific and
Cultural Organization

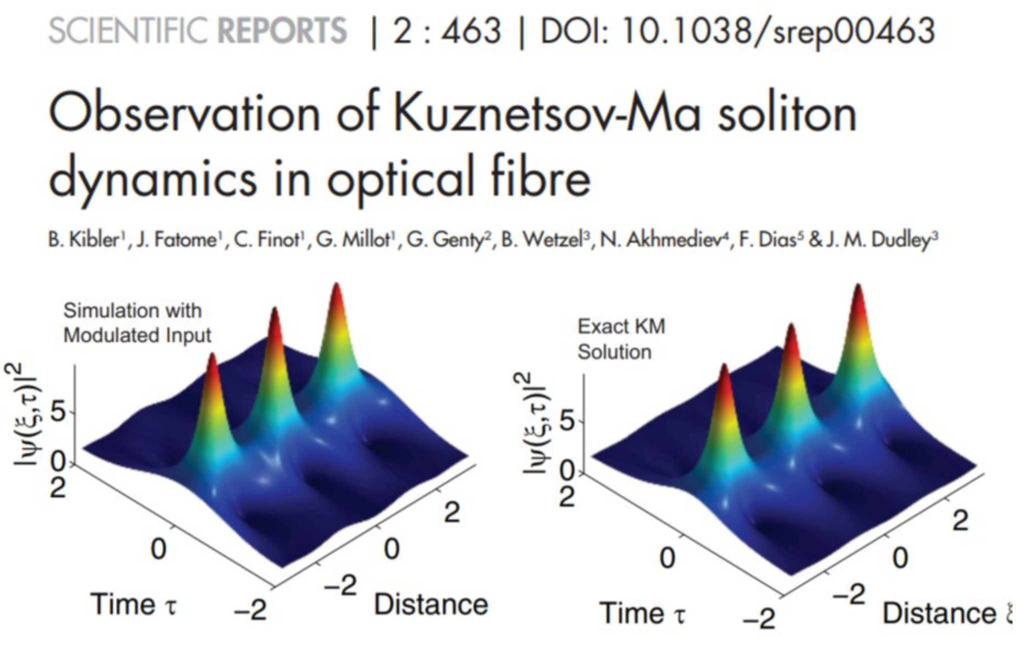
International
Year of Light
2015

The beginnings of the International Year of Light!

What an honour to write the first International Year of Light (IYL2015) blog post of 2015! The next twelve months will see a tremendous global effort to promote light science and applications throu…

https://tinyurl.com/startofIYL

2012. Bertand Kibler & @ChrisFINOT extend the rogue wave family with the Kusnetsov-Ma soliton. @fredericdiasUCD and I celebrate with Kuznetsov & Zakharov as part of @ERC_research MULTIWAVE (https://cordis.europa.eu/project/id/290562/reporting)

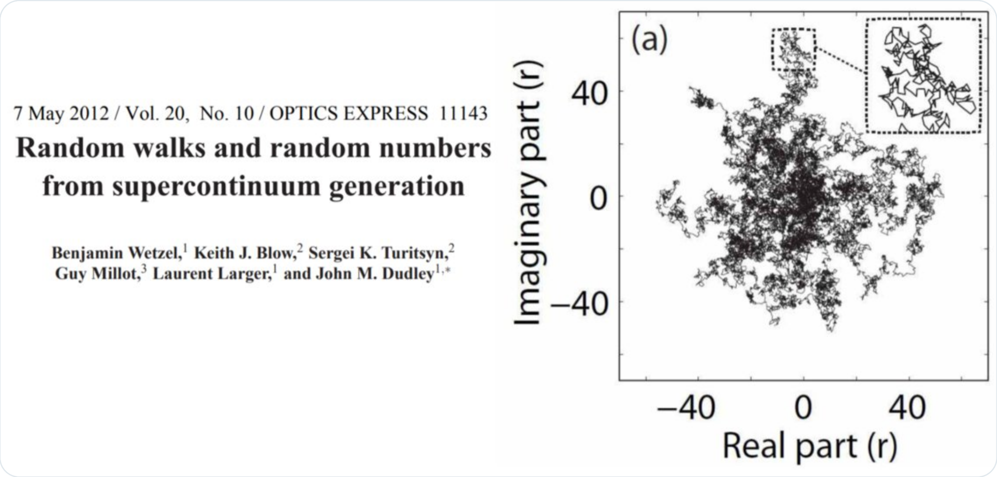


SCIENTIFIC REPORTS | 2 : 463 | DOI: 10.1038/srep00463

Observation of Kuznetsov-Ma soliton dynamics in optical fibre

B. Kibler[1], J. Fatome[1], C. Finot[1], G. Millot[1], G. Genty[2], B. Wetzel[3], N. Akhmediev[4], F. Dias[5] & J. M. Dudley[3]

2012. Another paper without much immediate interest perhaps but which I really like - randomness in the supercontinuum. With @Benj_Wetzel @im_sergei @LaurentLarger

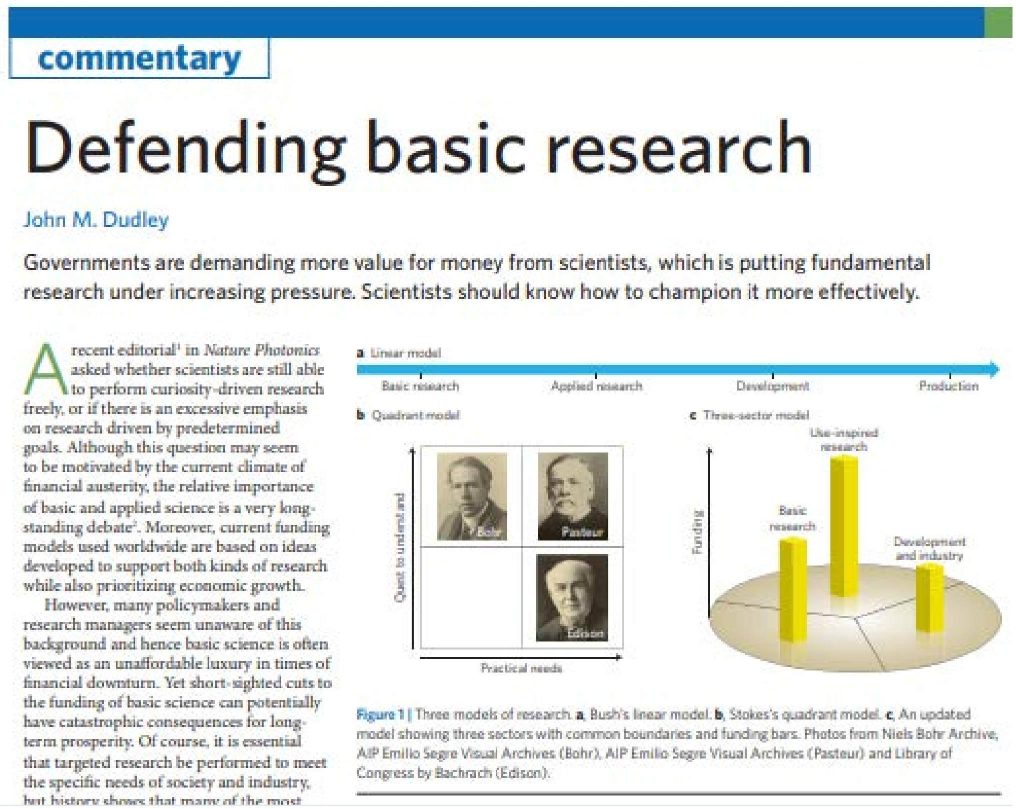


7 May 2012 / Vol. 20, No. 10 / OPTICS EXPRESS 11143

Random walks and random numbers from supercontinuum generation

Benjamin Wetzel,[1] Keith J. Blow,[2] Sergei K. Turitsyn,[2] Guy Millot,[3] Laurent Larger,[1] and John M. Dudley[1,*]

2013. Doing some politics lobbying for the International Year of Light at the UN with @OpticalSociety @SPIEtweets @EuroPhysSoc Yanne Chembo & many others. And a nice opportunity to promote the importance of basic research.



commentary

Defending basic research

John M. Dudley

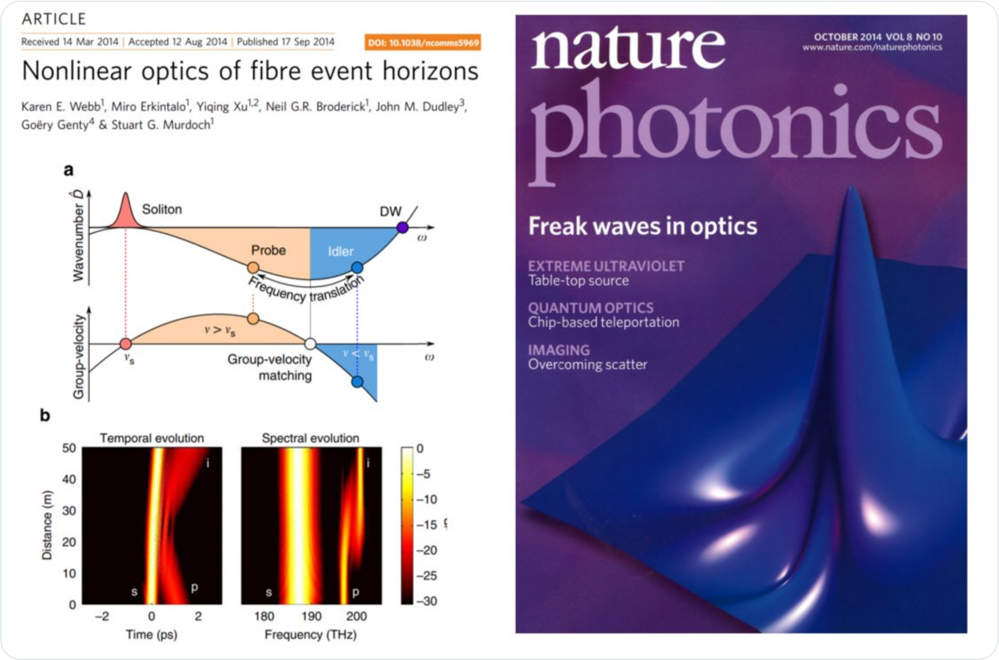
Governments are demanding more value for money from scientists, which is putting fundamental research under increasing pressure. Scientists should know how to champion it more effectively.

A recent editorial[1] in *Nature Photonics* asked whether scientists are still able to perform curiosity-driven research freely, or if there is an excessive emphasis on research driven by predetermined goals. Although this question may seem to be motivated by the current climate of financial austerity, the relative importance of basic and applied science is a very long-standing debate[2]. Moreover, current funding models used worldwide are based on ideas developed to support both kinds of research while also prioritizing economic growth.

However, many policymakers and research managers seem unaware of this background and hence basic science is often viewed as an unaffordable luxury in times of financial downturn. Yet short-sighted cuts to the funding of basic science can potentially have catastrophic consequences for long-term prosperity. Of course, it is essential that targeted research be performed to meet the specific needs of society and industry, but history shows that many of the most

Figure 1 | Three models of research. **a**, Bush's linear model. **b**, Stokes's quadrant model. **c**, An updated model showing three sectors with common boundaries and funding bars. Photos from Niels Bohr Archive, AIP Emilio Segre Visual Archives (Bohr), AIP Emilio Segre Visual Archives (Pasteur) and Library of Congress by Bachrach (Edison).

2014. Being President of @europhysoc keeps me very busy, but somehow managed to contribute to sorting out how event horizons linked to nonlinear optics with @MErkintalo & @UoA_Physics and also a nice cover picture with @NaturePhotonics



ARTICLE

Received 14 Mar 2014 | Accepted 12 Aug 2014 | Published 17 Sep 2014 DOI: 10.1038/ncomms5969

Nonlinear optics of fibre event horizons

Karen E. Webb[1], Miro Erkintalo[1], Yiqing Xu[1,2], Neil G.R. Broderick[1], John M. Dudley[3], Goëry Genty[4] & Stuart G. Murdoch[1]

nature photonics

OCTOBER 2014 VOL 8 NO 10
www.nature.com/naturephotonics

Freak waves in optics

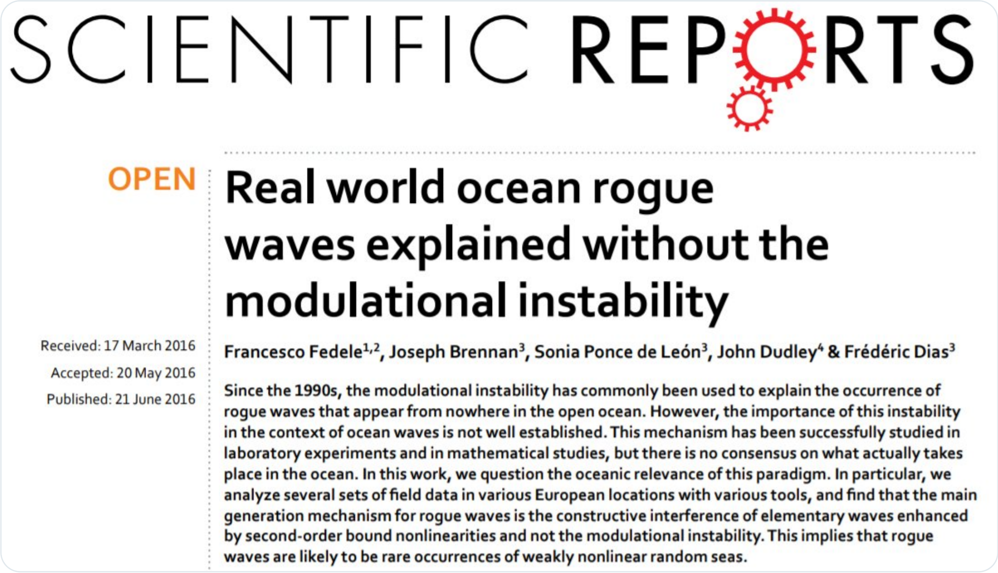
EXTREME ULTRAVIOLET
Table-top source

QUANTUM OPTICS
Chip-based teleportation

IMAGING
Overcoming scatter

2015 The International Year of Light was the focus of this year, trying to somehow speak at events around the world and follow what went on worldwide.

2016. Starting to work on real-world rogue waves with @FredericDiasUCD and the results are quite surprising ... But there are still many open questions and it's not cut and dried at all.



SCIENTIFIC REPORTS

OPEN

Real world ocean rogue waves explained without the modulational instability

Received: 17 March 2016
Accepted: 20 May 2016
Published: 21 June 2016

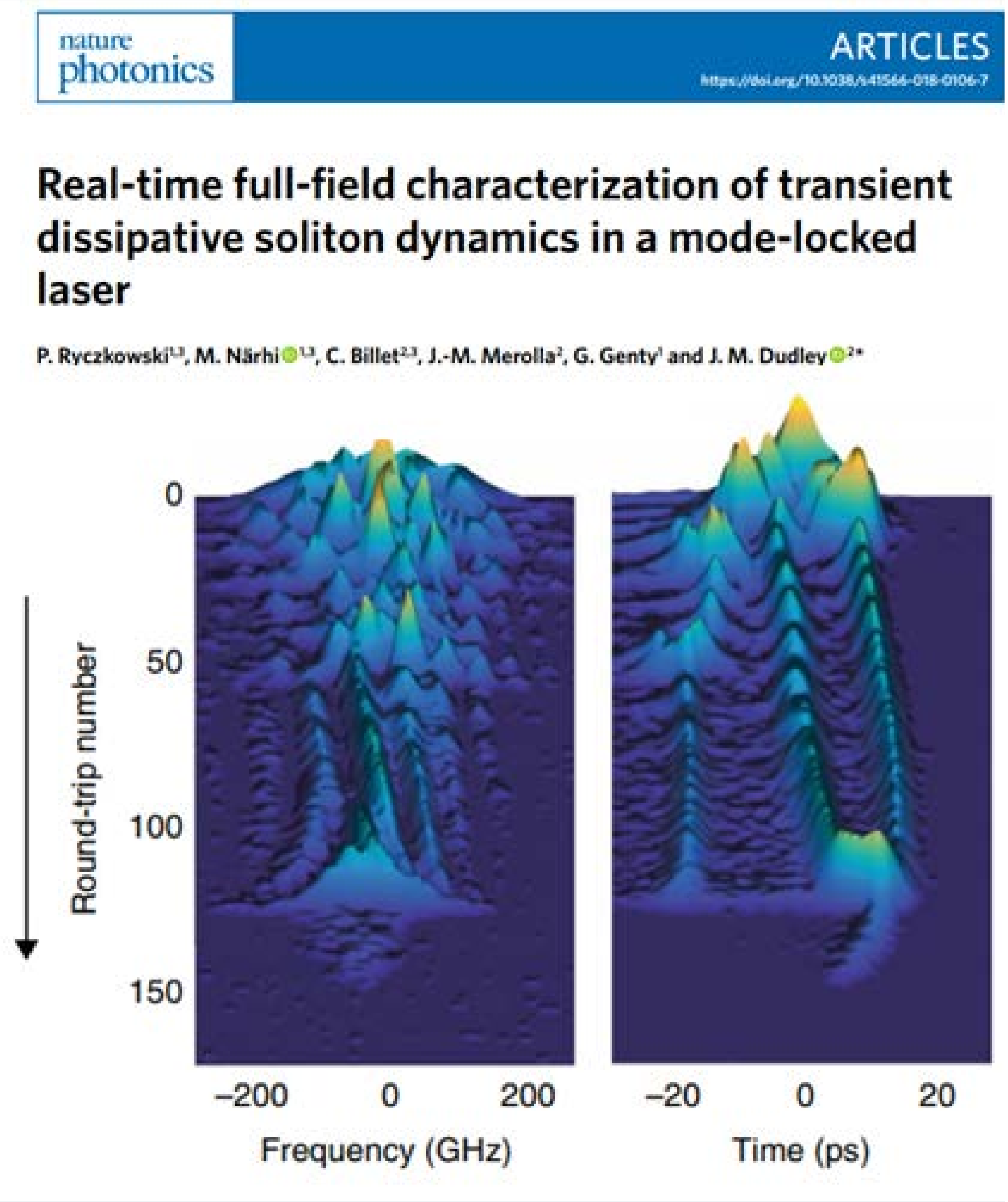
Francesco Fedele[1,2], Joseph Brennan[3], Sonia Ponce de León[3], John Dudley[4] & Frédéric Dias[3]

Since the 1990s, the modulational instability has commonly been used to explain the occurrence of rogue waves that appear from nowhere in the open ocean. However, the importance of this instability in the context of ocean waves is not well established. This mechanism has been successfully studied in laboratory experiments and in mathematical studies, but there is no consensus on what actually takes place in the ocean. In this work, we question the oceanic relevance of this paradigm. In particular, we analyze several sets of field data in various European locations with various tools, and find that the main generation mechanism for rogue waves is the constructive interference of elementary waves enhanced by second-order bound nonlinearities and not the modulational instability. This implies that rogue waves are likely to be rare occurrences of weakly nonlinear random seas.

2017. Thanks to @fc_univ and @INSIS_CNRS, @FemtoSt is becoming a must-visit place on the conference calendar, and with help from @SylvestreT we were delighted this year to welcome @supuvir as well as @milespadgett and Michael Berry as special guests

2018. Succeeded in getting recognition of a permanent and annual International Day of Light with first kickoff on 16 May 2018, anniversary of the first laser operation! @IDLofficial is now a thing! Also managed to get some great results on real time measurements with @GGoery


UNESCO
UNESCO
IDL 2018



nature photonics

ARTICLES

https://doi.org/10.1038/s41566-018-0106-7

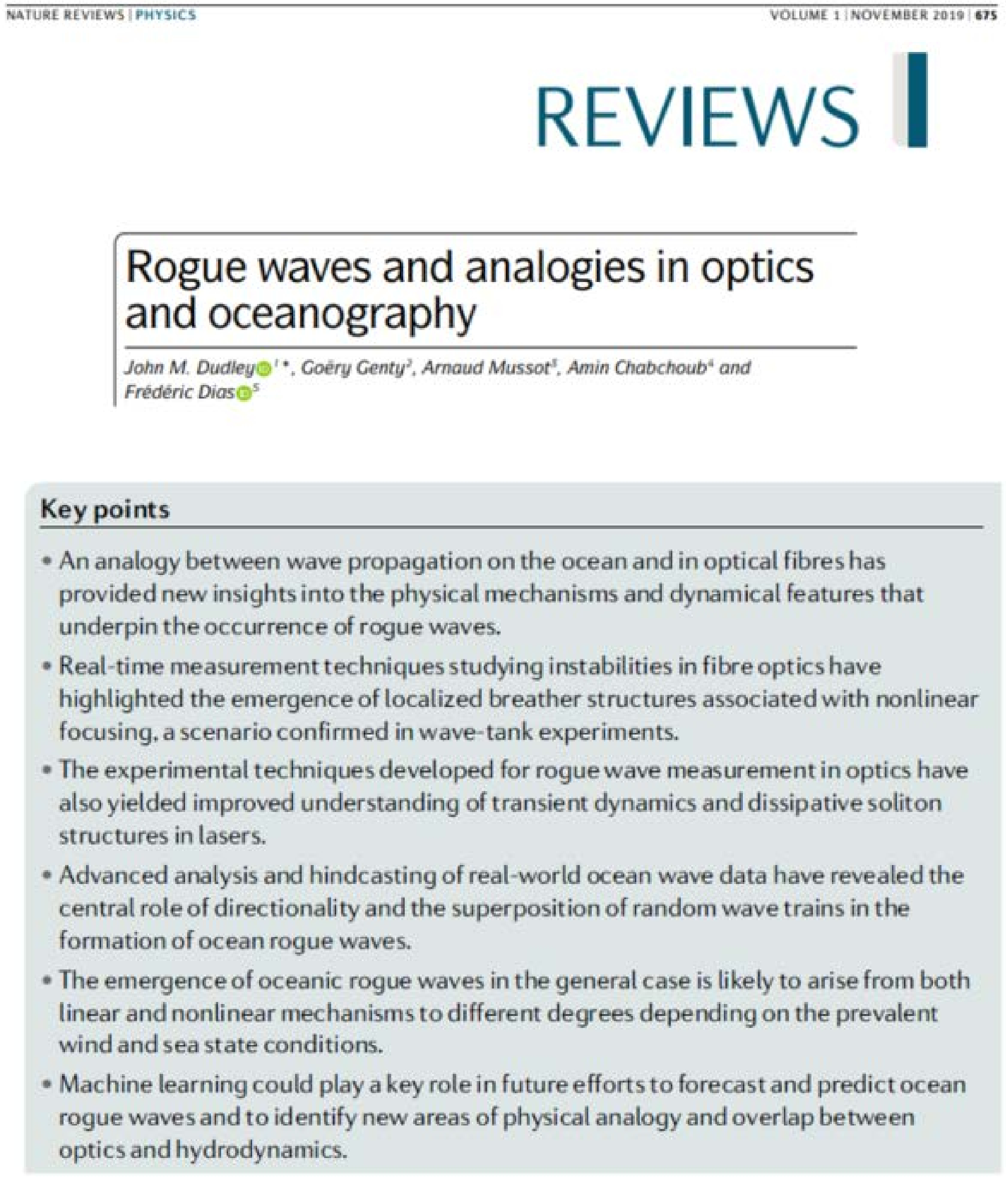
Real-time full-field characterization of transient dissipative soliton dynamics in a mode-locked laser

P. Ryczkowski[1,3], M. Närhi[1,3], C. Billet[2,3], J.-M. Merolla[2], G. Genty[1] and J. M. Dudley[2]*

2018. Thanks to @JeremyQuerenet @ClaireDupouet for all the outreach support. I am really not a fan of manipulative pseudoscience fakery and love the challenge to persuade that the world is even more wonderful when you understand it. Even firewalking is just physics!

2019. This year @IDLofficial was at @ictpnews which gives me the chance to thank @rachelpcwon @niemela @ptolemytortoise and @jesswade again for their fantastic support!

2019. Also great fun to write review of 10 years work on optical & hydrodynamic rogue wave with @FredericDiasUCD @GGoery @ArnaudMussot @DrAminChabchoub and new results continue to surprise thanks to great students like @cocolapre and @SpSolveig



NATURE REVIEWS | PHYSICS VOLUME 1 | NOVEMBER 2019 | 675

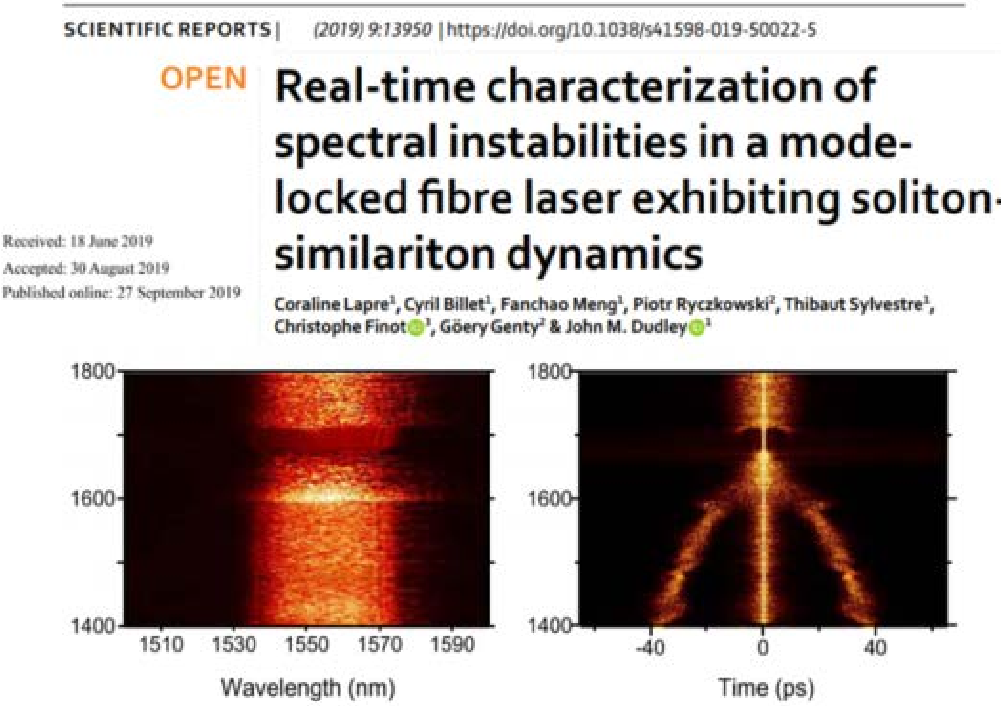
REVIEWS

Rogue waves and analogies in optics and oceanography

John M. Dudley[1], Goëry Genty[2], Arnaud Mussot[3], Amin Chabchoub[4] and Frédéric Dias[5]*

Key points

- An analogy between wave propagation on the ocean and in optical fibres has provided new insights into the physical mechanisms and dynamical features that underpin the occurrence of rogue waves.
- Real-time measurement techniques studying instabilities in fibre optics have highlighted the emergence of localized breather structures associated with nonlinear focusing, a scenario confirmed in wave-tank experiments.
- The experimental techniques developed for rogue wave measurement in optics have also yielded improved understanding of transient dynamics and dissipative soliton structures in lasers.
- Advanced analysis and hindcasting of real-world ocean wave data have revealed the central role of directionality and the superposition of random wave trains in the formation of ocean rogue waves.
- The emergence of oceanic rogue waves in the general case is likely to arise from both linear and nonlinear mechanisms to different degrees depending on the prevalent wind and sea state conditions.
- Machine learning could play a key role in future efforts to forecast and predict ocean rogue waves and to identify new areas of physical analogy and overlap between optics and hydrodynamics.



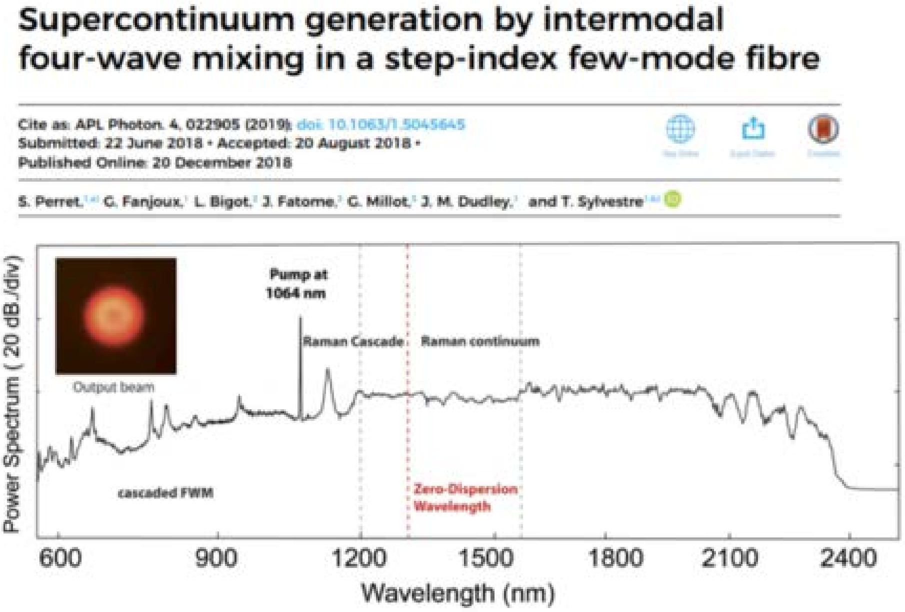
SCIENTIFIC REPORTS | *(2019) 9:13950* | https://doi.org/10.1038/s41598-019-50022-5

OPEN

Real-time characterization of spectral instabilities in a mode-locked fibre laser exhibiting soliton-similariton dynamics

Received: 18 June 2019
Accepted: 30 August 2019
Published online: 27 September 2019

Coraline Lapre[1], Cyril Billet[1], Fanchao Meng[1], Piotr Ryczkowski[2], Thibaut Sylvestre[1], Christophe Finot[3], Göery Genty[2] & John M. Dudley[1]

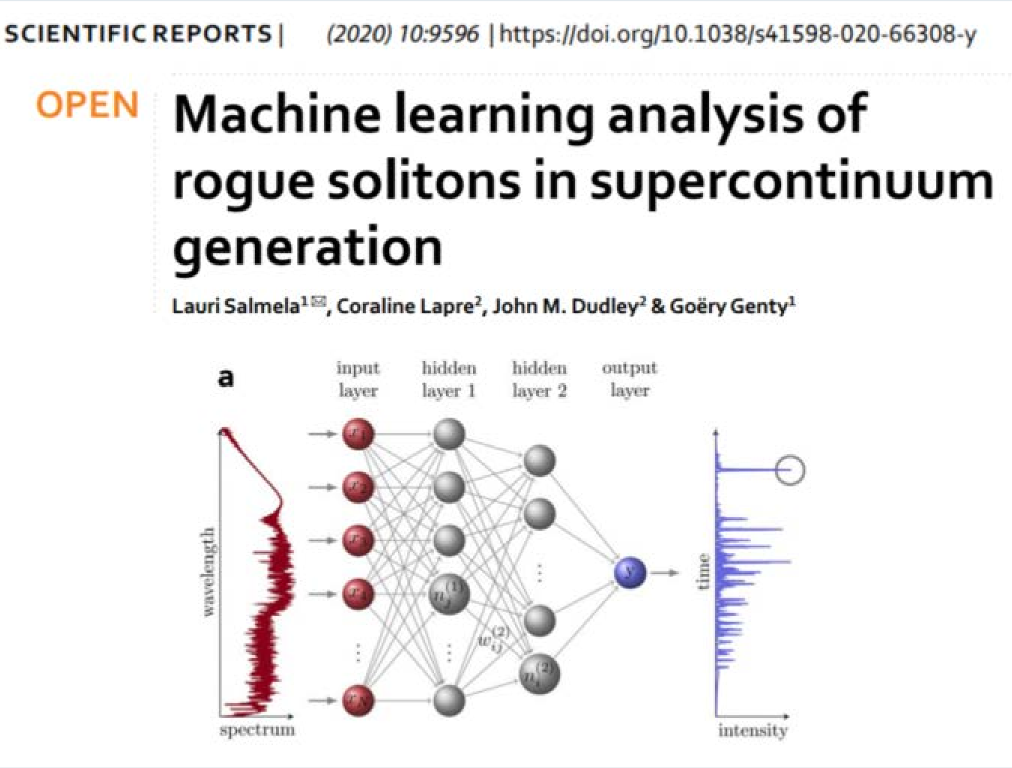


Supercontinuum generation by intermodal four-wave mixing in a step-index few-mode fibre

Cite as: APL Photon. 4, 022905 (2019); doi: 10.1063/1.5045645
Submitted: 22 June 2018 • Accepted: 20 August 2018 •
Published Online: 20 December 2018

S. Perret,[1,a)] G. Fanjoux,[1] L. Bigot,[2] J. Fatome,[3] G. Millot,[3] J. M. Dudley,[1] and T. Sylvestre[1,b)]

2020. After twenty years, interesting to contemplate that perhaps AI will make us all redundant anyway, and this seems to be the direction we’re moving in with @salmelala !! (But not quite ready to retire just yet @GGoery @jctravs)

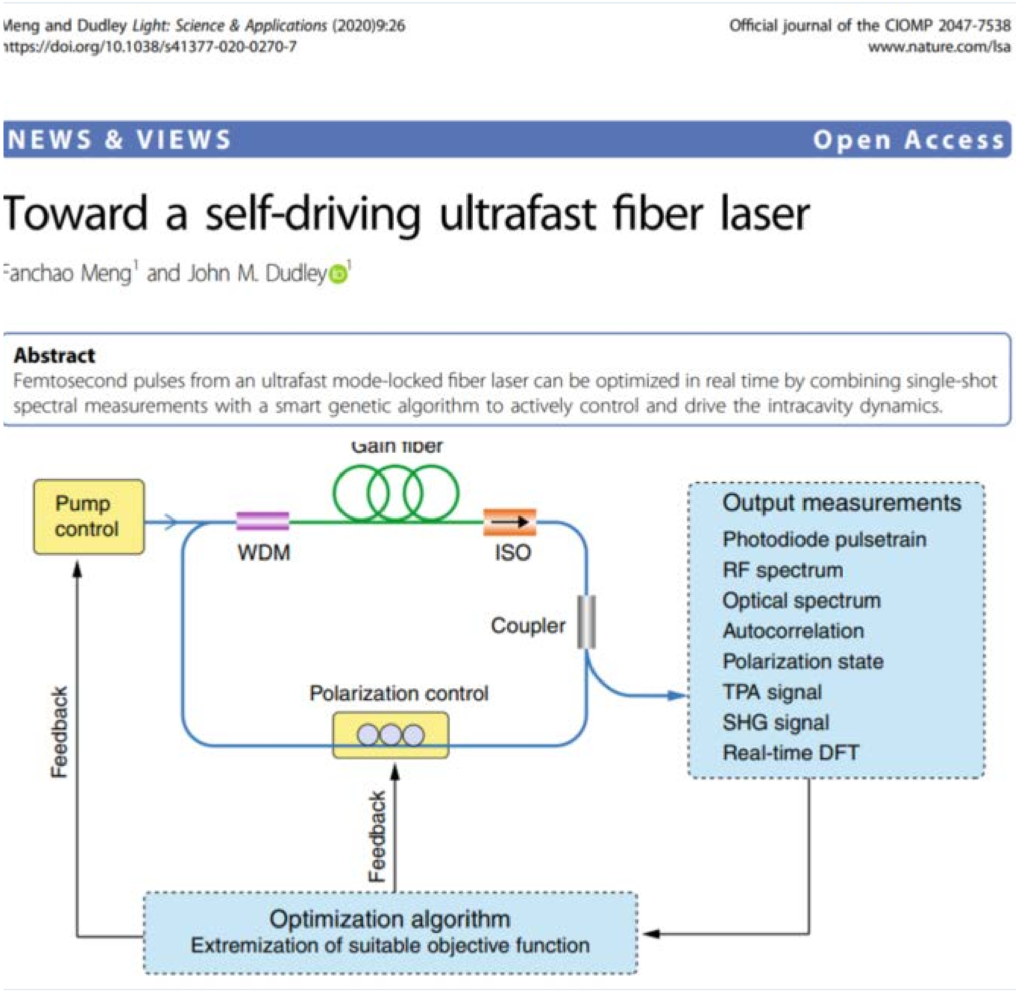


SCIENTIFIC REPORTS | (2020) 10:9596 | https://doi.org/10.1038/s41598-020-66308-y

OPEN

Machine learning analysis of rogue solitons in supercontinuum generation

Lauri Salmela[1]✉, Coraline Lapre[2], John M. Dudley[2] & Goëry Genty[1]



Meng and Dudley *Light: Science & Applications* (2020)9:26
https://doi.org/10.1038/s41377-020-0270-7

Official journal of the CIOMP 2047-7538
www.nature.com/lsa

NEWS & VIEWS **Open Access**

Toward a self-driving ultrafast fiber laser

Fanchao Meng[1] and John M. Dudley[1]

Abstract
Femtosecond pulses from an ultrafast mode-locked fiber laser can be optimized in real time by combining single-shot spectral measurements with a smart genetic algorithm to actively control and drive the intracavity dynamics.

2020. So that's it. Thanks again especially for all the local support from @fc_univ @Univ_BFC @INSIS_CNRS @CNRS_Centre_Est @Jacques_Bahi @LaurentLarger @FemtoSt and the many many others without whom nothing would work!! And many apologies to all I inevitably missed.

@ThreadReaderApp Unroll

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