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**Jianying Zhou**  
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41.09 · PhD

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2,640  
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Introduction

### Skills and Expertise

Information Technology   Optics   Photonics   Laser   Nonlinear Optics   Spectra   Diffraction   Femtosecond Lasers   Metamaterials  
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### Research Experience

Jan 2000 - Jan 2002

#### Max Planck Institute for Solid State Research

Stuttgart, Germany

##### Position

Visiting scientist



Dec 1991

#### Sun Yat-Sen University

State Key Laboratory of Optoelectronic Materials and Technologies · Guangzhou, China

##### Position

Professor (Full)



Mar 1984 - Oct 1987

#### Imperial College London

Department of Physics · London, United Kingdom

##### Position

PhD Student



## Network

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## Cited






[View All](#)**Federico Capasso****Gaetano Assanto****Willem L. Vos****Frank W Wise****Shin-Tson Wu**

## Cited By

[View All](#)**Sujit Kumar Sahoo****Zheng Cheng****Allard P. Mosk****Yinglin Song****J. Y. Liu**






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Red Sea University
- **Arun Vivek**  
Loyola College
- **Igor Melnikov**  
University of Illinois, Urbana-Champaign
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Utrecht University
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## Following

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- **Gershon Kurizki**  
Weizmann Institute of Science
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University of Science and Technology of China
- **Neil Anthony Dodgson**  
Victoria University of Wellington
- **Marta Castillejo**  
Spanish National Research Council
- **Meng-Lian Gong**  
Sun Yat-Sen University

## Projects

Projects (5)

**Autostereoscopic display with directional backlight**[Project](#)[View](#)

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**Sub-100 nm non-marking optical imaging with modulated light field**[Project](#)[View](#)

2 Updates

**Ultrafast optical signal processing**[Project](#)[View](#)[Show All](#)



## Research

Research Items (256)

Search by publication title or keyword

**Exploiting the point spread function for optical imaging through a scattering medium based on deconvolution method**[Article](#)

Jun 2019

Hexiang He ·  Xiangsheng Xie · Yikun Liu · [...] ·  Jianying Zhou[View](#)

26 Reads

**Depth-resolved and auto-focus imaging through scattering layer with wavelength compensation**[Article](#)

Jun 2019

Jinbo Liang · Jiefan Cai ·  Junpeng Xie · [...] ·  Xiangyang Yu


Imaging techniques through turbid materials have been extensively studied in recent years. The challenge now is to recover objects in a large field of view with depth-resolving ability. We present a method to image through a thin scattering layer automatically with the depth of the object detectable. By revealing the wavelength–depth-matching relation based on the axial memory effect, this method can automatically search the

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**P-105: A Directional Backlight Auto-stereoscopic Display with a LCD as Backlight**[Article](#)

Jun 2019

Xuehao Chen · Kunyan Li · Juan Ding · [...] ·  Jianying Zhou

A LCD as backlight is applied to build up a directional backlight auto-stereoscopic display system. The greyscale images used to control LCD backlight are simulated and created efficiently. A real-time auto-stereoscopic display system is set up, providing a great extensibility for the stereomicroscopy.

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**64-3: An intelligent system for vision screening and training**[Article](#)

Jun 2019

Xiaohe Li ·  Kunyang Li · Hantao Zhang · [...] ·  Jianying Zhou

with the development of virtual reality technology, a new system related to vision would have been proposed, which not only enable myope people to screen their vision independently but also makes it possible to improve people's vision. In addition, it will reduce labor and medical consumables in the visual acuity screening.

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**Extended depth-resolved imaging through a thin scattering medium with PSF manipulation**[Article](#) [Full-text available](#)

Dec 2018

 Xiangsheng Xie · Huichang Zhuang · Hexiang He · [...] ·  Jianying Zhou

Human ability to visualize an image is usually hindered by optical scattering. Recent extensive studies have promoted imaging technique through turbid materials to a reality where color image can be restored behind scattering media in real time. The big challenge now is to recover objects in a large field of view with depth resolving ability. Based on the existing research results, we systematically study the physical relationship between

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**Information hiding scheme based on optical moiré-pixel matrix**[Article](#)

Dec 2018

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**Ultrafast switching of optical singularity eigenstates with compact integrable liquid crystal structures**[Article](#) [Full-text available](#)

Oct 2018

Yikun Liu ·  Haowen Liang ·  Chun-Wei Chen · [...] · Iam Choon Khoo

By using the strong nonlinear effect and ultrafast electronic response of cholesteric liquid crystals (CLC), ultrafast all optical switching between polarization vortex and phase vortex is realized in a system combining CLC and q-plate. The experimental result shows that switching with high modulation depth can be accomplished in less than 1 picosecond. Furthermore, CLC and q-plates will enable compact integrated devices with

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Jul 2018

 Haowen Liang · Qiaoling Lin ·  Xiangsheng Xie · [...] ·  Juntao Li[View](#)

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**Ultra-high Numerical Aperture Metalens at Visible Wavelengths**[Article](#)

Apr 2018

 Haowen Liang · Qiaoling Lin ·  Xiangsheng Xie · [...] ·  Juntao Li[View](#)

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**Investigation on quantitative uniformity evaluation for directional backlight auto-stereoscopic displays**[Article](#) [Full-text available](#)

Apr 2018

Jieyong He ·  Quanquan Zhang ·  Jiahui Wang · [...] ·  Haowen Liang

This work provides a quantitative evaluation on the uniformity of autostereoscopic 3D (AS3D) displays. The single-unit uniformity UM is defined to describe the display quality at different viewing positions, then the overall display quality of an AS3D system is determined by the inter-unit uniformity ŪM. As an example, the uniformity of a directional backlight 3D (DB3D) display is experimentally evaluated. Moreover, a visualized

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**Imaging of objects through a thin scattering layer using a spectrally and spatially separated reference**[Article](#)

Apr 2018

Xiaoqing Xu ·  Xiangsheng Xie ·  T. Abhilash · [...] ·  Allard P. Mosk

Incoherently illuminated or luminescent objects give rise to a low-contrast speckle-like pattern when observed through a thin diffusive medium, as such a medium effectively convolves their shape with a speckle-like point spread function (PSF). This point spread function can be extracted in the presence of a reference object of known shape. Here it is shown that reference objects that are both spatially and spectrally separated from

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**Focusing optical waves with a rotationally symmetric sharp-edge aperture**[Article](#)


Apr 2018

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**6.3: Glasses-free Virtual Reality for Rehabilitation of Stroke Survivors**[Article](#)

Apr 2018

Hantao Zhang · Luqi Lin · Yuan Liu · [...] ·  Dongfeng Huang



Different from conventional head-mounted virtual reality, we achieve a high quality glasses-free virtual reality (VR) platform by combining full HD directional backlight 3D display with gesture controller. The glasses-free VR display enables full resolution, low crosstalk and wide viewing angle, which is able to provide precise depth information. Attributed to the excellent 3D effect without any assisting goggles, our glasses-free VR can be

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Mar 2018

 Xiangsheng Xie · Huichang Zhuang · Hexiang He · [...] ·  Jianying Zhou[View](#)

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**Supplementary Material 2**[Data](#) [File available](#)




Mar 2018

 Xiangsheng Xie · Huichang Zhuang · Hexiang He · [...] ·  Jianying Zhou[View](#)

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**Optics Communications Global control of colored moiré pattern in layered optical structures**[Article](#) [Full-text available](#)

Jan 2018

 Kunyang Li ·  Yangui Zhou · Di Pan · [...] ·  Jianying Zhou



Accurate description of visual effect of colored moiré pattern caused by layered optical structures consisting of gratings and Fresnel lens is proposed in this work. The colored moiré arising from the periodic and quasi-periodic structures is numerically simulated and experimentally verified. It is found that the visibility of moiré pattern generated by refractive optical elements is related to not only the spatial structures of

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**3D Object Imaging through Scattering Media**[Article](#)

Nov 2017

 Xiangsheng Xie · Huichang Zhuang · Hexiang He · [...] ·  Jianying Zhou

Human ability to visualize an image is usually hindered by optical scattering. Recent extensive studies have promoted imaging technique through turbid materials to a reality where color image can be restored behind scattering media in real time. The big challenge now is to recover a 3D object in a large field of view with depth resolving ability. Here, we reveal a new physical relationship between speckles generated from objects at

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**Imaging objects through scattering layers and around corners by retrieval of the scattered point spread function**[Article](#) [Full-text available](#)

Sep 2017

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**Ultrafast nonlinear photonic in cholesteric liquid crystals (Conference Presentation)**[Conference Paper](#) [Full-text available](#)

Sep 2017 · Liquid Crystals XXI

Yikun Liu ·  Jianying Zhou ·  Tsung-Hsien Lin · Iam-Choon Khoo[View](#)

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**Homogeneous free-form directional backlight for 3D display**[Article](#)

Aug 2017

Peter Krebs ·  Haowen Liang ·  Hang Fan · [...] ·  Jianying Zhou

Realization of a near perfect homogeneous secondary emission source for 3D display is proposed and demonstrated. The light source takes advantage of an array of free-form emission surface with a specially tailored light guiding structure, a light diffuser and Fresnel lens. A seamless and homogeneous directional emission is experimentally obtained which is essential for a high quality naked-eye 3D display.

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**Ultrafast Optical Signal Processing with Bragg Structures**[Article](#) [Full-text available](#)

May 2017

Yikun Liu ·  Shenhe Fu ·  Boris A. Malomed · [...] ·  Jianying Zhou


The phase, amplitude, speed, and polarization, in addition to many other properties of light, can be modulated by photonic Bragg structures. In conjunction with nonlinearity and quantum effects, a variety of ensuing micro- or nano-photonic applications can be realized. This paper reviews various optical phenomena in several exemplary 1D Bragg gratings. Important examples are resonantly absorbing photonic structures, chirped

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**P-88: Numerical Simulation and Quantitative Evaluation for Motional Display Uniformity in a Directional Backlight Glasses-free 3D Display**[Article](#)

May 2017

Jieyong He ·  Haowen Liang ·  Quanquan Zhang · [...] ·  Jianying Zhou

A quantitative evaluation for the display uniformity in a directional backlight system is proposed. Motional uniformity with multi-viewing position is analyzed to quantify the display quality, with a ray-tracing model based visualized simulation assisting. Display performance on motional uniformity is discussed and a solution is finally proposed to improve the uniformity, optimizing the 3D display system.

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**Diffraction Focusing of Waves in Time and in Space**[Article](#)

Apr 2017

Dror Weisman ·  Shenhe Fu ·  Manuel R Gonçalves · [...] · Ady Arie

We study the general wave phenomenon of diffractive focusing from a single slit for two types of waves and demonstrate several properties of this effect. Whereas in the first situation, the envelope of a surface gravity water wave is modulated in time by a rectangular function, leading to temporal focusing, in the second example, surface plasmon polariton waves are focused in space by a thin metal slit to a transverse width

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**Simulation based quantitative evaluation for display uniformity in a directional backlight auto-stereoscopic display**[Conference Paper](#)

Mar 2017 · Selected Papers of the Chinese Society for Optical Engineering Conferences held October and November 2016

Jieyong He ·  Haowen Liang ·  Quanquan Zhang · [...] ·  Jianying Zhou[View](#)

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**A high performance auto-stereoscopic display based on free-form surface backlight array and mix-teeth Fresnel lens**[Conference Paper](#)

Mar 2017 · Selected Papers of the Chinese Society for Optical Engineering Conferences held October and November 2016

Kunyang Li · Zhichao Wu · Di Pan · [...] ·  Jianying Zhou[View](#)

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**A Quantum Dot Array for Enhanced Tricolor Liquid-Crystal Display**[Article](#) [Full-text available](#)

Feb 2017

Yikun Liu · Juan Lai · Xiaonan Li · [...] ·  Jianying Zhou

In the traditional liquid crystal display, at least two-thirds of the energy is wasted by tricolor separation color filter array due to its blocking working principle. In this paper, a well arrangement quantum dots (QD) array, which is excited by blue back light, was fabricated to spatially separate the red-green-blue (RGB) color. This QD array is further placed onto traditional color filter array, by matching the corresponding color filter pixel, in

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**Diffraction Focusing of Waves in Time and in Space**[Article](#)

Jan 2017

Dror Weisman ·  Shenhe Fu ·  Manuel R Gonçalves · [...] · Ady Arie

We study the general wave phenomenon of diffractive focusing from a single slit for two types of waves and demonstrate several properties of this effect. Whereas in the first situation, the envelope of a surface gravity water wave is modulated in time by a rectangular function, leading to temporal focusing, in the second example, surface plasmon polariton waves are focused in space by a thin metal slit to a transverse width

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**Generalized vector wave theory for ultrahigh resolution confocal optical microscopy**[Article](#)

Jan 2017

Ken Yang ·  Xiangsheng Xie ·  Jianying Zhou

Polarization modulation of a tightly focused beam in a confocal imaging scheme is considered for incident and collected light fields. Rigorous vector wave theory of a confocal optical microscopy is developed, which provides clear physical pictures without the requirement for fragmentary calculations. Multiple spatial modulations on polarization, phase, or amplitude of the illuminating and the detected beams can be mathematically

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**Illumination optics in emerging naked-eye 3D display**[Article](#) [Full-text available](#)

Jan 2017

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**Directional backlight liquid crystal autostereoscopic display: technical challenges, research progress, and prospect (Conference Presentation)**[Conference Paper](#)

Nov 2016 · SPIE Organic Photonics + Electronics

Hang Fan · Kunyang Li · Yangui Zhou · [...] · Jianying Zhou

Recent upsurge on virtual and augmented realities (VR and AR) has re-ignited the interest to the immerse display technology. The VR/AR technology based on stereoscopic display is believed in its early stage as glasses-free, or autostereoscopic display, will be ultimately adopted for the viewing convenience, visual comfort and for the multi-viewer purposes. On the other hand, autostereoscopic display has not yet received

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**Nonlinear femtosecond pulse compression in cholesteric liquid crystals (Conference Presentation)**[Conference Paper](#)

Nov 2016 · SPIE Organic Photonics + Electronics

Yikun Liu · Jianying Zhou · Tsung-Hsien Lin · Iam-Choon Khoo

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**Homogeneous illumination for directional backlight autostereoscopic display**[Conference Paper](#)

Oct 2016 · 2016 IEEE Photonics Conference (IPC)

Yangui Zhou · Hang Fan · Kunyang Li · [...] · Jianying Zhou

Directional backlight array widely adopted in various display systems is in general accompanied with visual inhomogeneity, moire pattern, Mach band and defect. Removal of the defects is shown to be realizable by a systematical optical design scenario, which was tested with experimental verification.

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**A 2D/3D Switchable Directional-Backlight Autostereoscopic Display Using Polymer Dispersed Liquid Crystal Films**[Article](#)

Sep 2016

Haiyu Chen · Haowen Liang · Wei-Hung Lai · [...] · Juntao Li

A 2D/3D switchable auto-stereoscopic display with spatial and sequential hybrid control (SSHC) using polymer dispersed liquid crystal (PDLC) films is studied. The light propagation in the SSHC system is simulated with a Monte Carlo ray-tracing method. Relationship between the 2D uniformity and anisotropy factor as well as mean free path is obtained by a series of simulation cases. The uniformity reaches over 85% in

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**High speed color imaging through scattering media with a large field of view**[Article](#) [Full-text available](#)

Sep 2016

Huichang Zhuang · Hexiang He · Xiangsheng Xie · Jianying Zhou

Optical imaging through complex media has many important applications. Although research progresses have been made to recover optical image through various turbid media, the widespread application of the technology is hampered by the recovery speed, requirement on specific illumination, poor image quality and limited field of view. Here we demonstrate that above-mentioned drawbacks can be essentially overcome.

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**Supplementary Information**[Data](#) [File available](#)

Sep 2016

Huichang Zhuang · Hexiang He · Xiangsheng Xie · Jianying Zhou

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**Supplementary Video 2**[Data](#) [File available](#)

Sep 2016

Huichang Zhuang · Hexiang He · Xiangsheng Xie · Jianying Zhou

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**Virtual reality and motion sensing conjoint applications based on stereoscopic display**[Conference Paper](#)

Aug 2016 · 2016 Progress in Electromagnetic Research Symposium (PIERS)

Jiahui Wang · Yuman Xu · Haowen Liang · [...] · Jianying Zhou

To demonstrate the feasibility and compatibility of virtual reality and motion sensing conjoint applications, a visual keyboard system is presented. In the method, when a viewer is touching the stereoscopic keyboard image in air, the system can reconstruct the position of the fingertip, output the information on the screen in real-time. This system has been demonstrated fine compatibility in skin color, ambient light and viewing angle.

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**Simulation approach of display uniformity in a backlight illuminated lens array**[Conference Paper](#)

Aug 2016 · 2016 Progress in Electromagnetic Research Symposium (PIERS)

Yangui Zhou · Hang Fan · Kunyang Li · [...] · Jianying Zhou

The relative retinal illumination (RRI) distribution of a display system consisting of arrayed backlight units, focusing lenses and viewing screen is simulated with Monte Carlo ray tracing method. A random scattering model is applied to describe the optical seam effect in the vicinity of the stitching. RRI distribution on the screen viewed at different locations for an directional backlight display system is simulated, giving rise to a

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**Visual effect of a linear Fresnel lens illuminated with a directional backlight**[Article](#)

Jun 2016

Kunyang Li · Hang Fan · Jiahui Wang · [...] · Yangui Zhou

A linear Fresnel lens illuminated by a directional backlight is studied. The light distribution on the lens surface visualized by a retina is simulated with a Monte Carlo ray-tracing technique, and the visualized display uniformity on the lens surface is found to depend critically on the lens quality as well as on the viewing position away from the light propagation axis. The effect of the light source configuration as well as the deviation of the

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**Ultrafast pulse compression, stretching-and-recompression using cholesteric liquid crystals**[Article](#) [Full-text available](#)

May 2016

Yikun Liu · You Wu · Chun-Wei Chen · [...] · I. C. Khoo

We have experimentally demonstrated the feasibility of direct compression, or stretching and recompression of laser pulses in a very wide temporal time scale spanning 10's fs to ~1 ps time with sub-mm thick cholesteric liquid crystal (CLC) cells. The mechanisms at work here are the strong dispersion at the photonic band-edges and nonlinear phase modulation associated with the non-resonant ultrafast molecular electronic

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**Fast structured illumination microscopy using rolling shutter cameras**[Article](#)

May 2016

Song Liyan · Hui-Wen Lu-Walther · Ronny Förster · [...] · Rainer Heintzmann

Spatial light modulators (SLM) update in a synchronous manner, whereas the data readout process in fast structured illumination systems is usually done using a rolling shutter camera with asynchronous readout. In structured illumination microscopy (SIM), this leads to synchronization problems causing a speed limit for fast acquisition. In this paper we present a configuration to overcome this limit by exploiting the extremely fast

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**65-4: Visual Effect Analysis for an Auto-stereoscopic Display Illuminated with Directional Backlight**[Article](#)

May 2016

Kunyang Li · Yangui Zhou · Hang Fan · [...] · Jianying Zhou

The visual effect in a directional backlight auto-stereoscopic display is analyzed with Monte Carlo ray-tracing technique. The effect of microstructures on the luminescence uniformity on a liquid crystal screen is simulated and experimentally investigated. Linear Fresnel focusing lens deviating from the ideal case is studied specifically as an image focusing element.

[View](#)**P-69: Studies on 2D/3D Switchable Autostereoscopic Display with Spatial and Sequential Hybrid Control Using PDLC Films**[Article](#)

May 2016

Haiyu Chen · Haowen Liang · Quanquan Zhang · [...] · I. C. Khoo

An effective approach to achieve 2D/3D switching in an autostereoscopic display with spatial and sequential hybrid control (SSHC) using polymer dispersed liquid crystal (PDLC) films is proposed. The Monte Carlo method is utilized to analyze the scattering interaction of diffusive PDLC layer within the system. And the experimental result is given for a two-viewpoint SSHC system. The results show that PDLC working as 2D/3D switch is

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**P-114: A Tunable Correlated-Color-Temperature Lighting with Two Blue LEDs and a Quantum-Dot Enhancement Film**[Article](#)

May 2016

Haowen Liang · Xiaohuang Su · Haiyu Chen · [...] · Jianying Zhou

We demonstrate a tunable correlated-color-temperature (CCT) scheme for quantum-dot (QD) lighting and backlight. The QDs are excited by two blue LEDs with different central wavelengths. Our experiment shows that the CCT of our device can be tuned from ~4900 K to >20,000 K. Warmer CCT suitable for general lighting can be obtained by enriching the red spectrum of the QDs. Optimizing the red and green QDs also helps to

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**Quantitative measurement of global crosstalk for 3D display: Global crosstalk measurement for 3D display**[Article](#) [Full-text available](#)

Apr 2016

Hang Fan · Xiaolu Wang · Haowen Liang · [...] · Jianying Zhou

A photo-detecting system based on photo-detector with calibrated optical response is developed to characterize the global crosstalk of three-dimensional (3D) displays over the entire display screen. Local screens areas are investigated, revealing that the crosstalk can be very inhomogeneous over the entire screens for typical stereoscopic display and autostereoscopic display. New quantification parameters for

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**High efficiency quantum dot and organic LEDs with a back-cavity and a high index substrate**[Article](#)

Apr 2016

Haowen Liang · Zhenyue Luo · Ruidong Zhu · [...] · Shin-Tson Wu

We report a back-cavity design to enhance the optical efficiency of a quantum dot light-emitting diode (QLED) or an organic light-emitting diode (OLED) for display and lighting applications. Our simulation results show that the back-cavity design exhibits two major advantages: (1) the transparent electrode helps to increase the transmittance of backward light despite using a semi-transparent metal electrode, and (2) the

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**Quantitative Evaluation for Luminance Uniformity in 3D Displays**[Article](#) [Full-text available](#)

Apr 2016

Xiaolu Wang · Hang Fan · Hongqin Ma · [...] · Jianying Zhou

An evaluation methodology is proposed to characterize the luminance uniformity in 3D displays. Averaged value and standard deviation are introduced to quantitatively describe luminance uniformity and hence evaluate image qualities of 3D displays. The proposed method was applied to evaluate a commercial 2D/3D switchable autostereoscopic 3D displays, revealing that both the luminance and the corresponding luminance

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**Simulation and Control of Display Uniformity in a Backlight Illuminated Image Array**[Article](#)

Feb 2016

Yangui Zhou · Hang Fan · Kunyang Li · [...] · Jianying Zhou

The relative retinal illumination (RRI) distribution of a display system consisting of arrayed backlight units, focusing lenses, and viewing screen is simulated with Monte Carlo ray tracing method. A random scattering model is applied to describe the optical seam effect in the vicinity of the stitching. RRI distribution on the screen viewed at different locations for an autostereoscopic display system is simulated, giving rise to a

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**Self-similar propagation of Hermite-Gauss water-wave pulses**[Article](#)

Jan 2016

Shenhe Fu · Yuval Tsur · Jianying Zhou · [...] · Ady Arie

We demonstrate both theoretically and experimentally propagation dynamics of surface gravity water-wave pulses, having Hermite-Gauss envelopes. We show that these waves propagate self-similarly along an 18-m wave tank, preserving their general Hermite-Gauss envelopes in both the linear and the nonlinear regimes. The measured surface elevation wave groups enable observing the envelope phase evolution of both

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**Propagation Dynamics of Nonspreading Cosine-Gauss Water-Wave Pulses**[Article](#) [Full-text available](#)

Dec 2015

Shenhe Fu · Yuval Tsur · Jianying Zhou · [...] · Ady Arie

Linear gravity water waves are highly dispersive; therefore, the spreading of initially short wave trains characterizes water surface waves, and is a universal property of a dispersive medium. Only if there is sufficient nonlinearity does this envelope admit solitary solutions which do not spread and remain in fixed forms. Here, in contrast to the nonlinear localized wave packets, we present both theoretically and experimentally a new type

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**Glasses-free 3D display with glasses-assisted quality: Key innovations for smart directional backlight autostereoscopy**[Conference Paper](#)

Dec 2015 · 2015 Visual Communications and Image Processing (VCIP)

Hang Fan · Yangui Zhou · Haowen Liang · [...] · Jianying Zhou

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**Pseudo-random arranged color filter array for controlling moiré patterns in display**[Article](#) [Full-text available](#)

Nov 2015

Yangui Zhou · Hang Fan · Sengzhong An · [...] · D.-H. Li

Optical display quality can be degraded by the appearance of moiré pattern occurring in a display system consisting of a basic matrix superimposed with a functional structured optical layer. We propose in this paper a novel pseudo-random arranged color filter array with the table number arranged with an optimal design scenario. We show that the moiré pattern can be significantly reduced with the introduction of the special

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**Full Resolution, Low Crosstalk, and Wide Viewing Angle Auto-Stereoscopic Display With a Hybrid Spatial-Temporal Control Using Free-Form Surface Backlight Unit**[Article](#) [Full-text available](#)

Jul 2015

 Hang Fan ·  Yangui Zhou ·  Jiahui Wang · [...] ·  Jianying Zhou




A full resolution, low crosstalk and wide viewing angle auto-stereoscopic display is demonstrated with the use of a novel free-form surface backlight (FFSB) technique, in conjunction with a hybrid spatial and temporal control scenario. The overall crosstalk coming from adjacent channels is shown to be lower than 5% even at a wide viewing angle, and minimum achievable crosstalk can be as small as 2.41%. The key

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**Optical sharper focusing in an anisotropic crystal**[Article](#) [Full-text available](#)

Jun 2015

 Sicong Wang ·  Xiangsheng Xie · Min Gu ·  Jianying Zhou


Optical super-resolution technique through tight focusing is a widely used technique to image material samples with anisotropic optical properties. The knowledge of the field distribution of a tightly focused beam in anisotropic media is both scientifically interesting and technologically important. In this paper, the optical properties of a uniaxial crystal with the optic axis perpendicular to the interface under a tight

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**Controlled light field concentration through turbid biological membrane for phototherapy**[Article](#) [Full-text available](#)

Jun 2015

Fujian Wang · Hexiang He · Huichang Zhuang · [...] ·  Jianying Zhou

Laser propagation through a turbid rat dura mater membrane is shown to be controllable with a wavefront modulation technique. The scattered light field can be refocused into a target area behind the rat dura mater membrane with a 110 times intensity enhancement using a spatial light modulator. The efficient laser intensity concentration system is demonstrated to imitate the phototherapy for human brain tumors. The power

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**P-164L: Late-News Poster: Enhancing the Light Outcoupling Efficiency of Quantum-Dot Light Emitting Diodes with Periodic Microstructures**[Article](#)

Jun 2015

 Haowen Liang ·  Ruidong Zhu ·  Shin-Tson Wu · [...] ·  Jianying Zhou

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**Enhancing the outcoupling efficiency of quantum dot LEDs with internal nano-scattering pattern**[Research](#)

May 2015

Ruidong Zhu · Yajie Dong · Shin-Tson Wu · [...] · Jianying Zhou

We report an effective method to extract light from quantum-dot light emitting diodes (QLEDs) by embedding an internal nano-scattering pattern structure. We use finite-difference time-domain method to analyze the light extraction efficiency of red QLEDs with periodic, quasi-random, and random internal nano-scattering pattern structures. Our simulation results indicate that random internal nano-scattering pattern can greatly

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**Enhancing the outcoupling efficiency of quantum dot LEDs with internal nano-scattering pattern**[Article](#) [Full-text available](#)

May 2015

Haowen Liang · Ruidong Zhu · Yajie Dong · [...] · Jianying Zhou

We report an effective method to extract light from quantum-dot light emitting diodes (QLEDs) by embedding an internal nano-scattering pattern structure. We use finite-difference time-domain method to analyze the light extraction efficiency of red QLEDs with periodic, quasi-random, and random internal nano-scattering pattern structures. Our simulation results indicate that random internal nano-scattering pattern can greatly

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**All-optically configuring the inverse Faraday effect for nanoscale perpendicular magnetic recording**[Article](#) [Full-text available](#)

May 2015

Sicong Wang · Xiangping Li · Jianying Zhou · Min Gu

Nanoscale reversal of the longitudinal magnetization ( $M_z$ ) is highly desired in the ultrahigh density perpendicular magnetic recording. In this paper, an all-optical method to realize the reversal of  $M_z$  with an ultrasmall lateral size through configuring the inverse Faraday effect (IFE) is numerically proposed. This feature is achieved by optical coherent configuration of the IFE in the central and peripheral regions of

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**Nonlinear light propagation in cholesteric liquid crystals with a helical Bragg microstructure**[Article](#)

Apr 2015

Yikun Liu · Shenhe Fu · Xing Zhu · [...] · Gershon Kurizki

Nonlinear optical propagation in cholesteric liquid crystals (CLC) with a spatially periodic helical molecular structure is studied experimentally and modeled numerically. This periodic structure can be seen as a Bragg grating with a propagation stopband for circularly polarized light. The CLC nonlinearity can be strengthened by adding absorption dye, thus reducing the nonlinear intensity threshold and the necessary propagation length.

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**Quantitative measurement and control of optical Moiré pattern in an autostereoscopic liquid crystal display system**[Article](#) [Full-text available](#)

Feb 2015

 Yangui Zhou ·  Peter Krebs ·  Hang Fan · [...] ·  Jianying Zhou

A quantitative description of an optical moiré pattern produced in an autostereoscopic liquid crystal display system is proposed using a contrast sensitivity function. The numerical simulation, carried out in the spatial frequency domain, is applied to a directional backlit, spatially and temporally hybrid controlled display system. The moiré pattern produced from the superimposed binary optical components is examined

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**Tunable storage of optical pulses in a tailored Bragg-grating structure**[Article](#) [Full-text available](#)

Feb 2015

 Shenhe Fu ·  Yongyao Li ·  Yikun Liu · [...] ·  Boris A. Malomed

Scenarios for controllable creation, trapping, and holding of single and multiple solitons in a specially designed nonlinear Bragg grating (BG) are proposed. The setting includes a chirped BG segment, which is linked via a local defect to a uniform BG with a built-in array of defects. A parabolic relation between the trapping position of the incident soliton and its power is obtained. Simultaneous trapping of two and three solitons at

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**Surface Gravity Water Wave Airy Wavepacket**[Conference Paper](#) [Full-text available](#)

Jan 2015 · Laser Science

 Shenhe Fu ·  Yuval Tsur ·  Jianying Zhou · [...] ·  Ady Arie

We study the propagation dynamics of surface gravity water wave Airy pulses in the linear and nonlinear regimes. The low carrier frequency enables observing the position-dependent phase of the Airy pulse for the first time.

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**Ultralong pure longitudinal magnetization needle induced by annular vortex binary optics**[Article](#) [Full-text available](#)

Sep 2014

 Sicong Wang ·  Xiangping Li ·  Jianying Zhou · Min Gu

In this Letter, based on the Richards and Wolf diffraction theory, an ultralong optical needle with pure transverse polarization is numerically generated by tightly focusing an azimuthally polarized beam through an annular vortex binary filter. Such an ultralong transversely polarized optical needle is generated through the  $\pi$  phase shift between adjacent rings of the binary filter. We show that such a pure transverse optical

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**Displaying a full high-definition, high-quality 3D image without glasses**[Article](#) [Full-text available](#)

Aug 2014

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**Optimizing Time-Multiplexing Auto-Stereoscopic Displays With a Genetic Algorithm**[Article](#) [Full-text available](#)

Aug 2014

 Haowen Liang · Senzhong An ·  Jiahui Wang · [...] ·  Jianying Zhou

A figure-of-merit (FOM) of an auto-stereoscopic display system is introduced and adopted to characterize the system performance. This FOM takes into account of the ratio of the signal to the noise arising from the crosstalk from the adjacent channels as well as the brightness uniformity of viewing areas; hence, it is directly related to the glasses-free 3D viewing comfort. With a steadily improving FOM as a target, the genetic

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**Pancharatnam-phase-based characterization for the diffraction of an optical vortex beam**[Article](#)

May 2014

 Mengnan Zhao · Liangxin Yang ·  Xiangsheng Xie · [...] ·  Jianying Zhou

We present an interferometric method to recover the phase diffraction patterns of a Gaussian optical vortex (OV) beam with different topological charges. The patterns are encoded and converted into polarization information, which can be decoded and measured by an analyser and a camera. Helical diffraction structures due to the spiral phase plates are obtained by a Mach–Zehnder interferometer. A numerical method based

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**Application of knife-edge technique to measurement of spatial structure of focusing spot**[Article](#)





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**High-quality autostereoscopic display with spatial and sequential hybrid control**[Article](#) [Full-text available](#)

Dec 2013

 Jiahui Wang ·  Haowen Liang ·  Hang Fan · [...] ·  Jianying Zhou

A novel design of an autostereoscopic display system with full resolution, low crosstalk, and weak Moiré pattern is presented. The system involves the usage of an LED backlight array and a liquid crystal display (LCD) panel, in conjunction with a Fresnel lens array, to form a 3D optical image system. The finer temporal synchronization is made possible with a dynamic synchronized backlight, so that the scanning of the LCD is in

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**Buffering and Trapping Ultrashort Optical Pulses in Concatenated Bragg Gratings**[Article](#)

Dec 2013

 Shenhe Fu · Yikun Liu ·  Yongyao Li · [...] ·  Jianying Zhou

Strong retardation of ultrashort optical pulses, including their deceleration and stoppage in the form of Bragg solitons in a cascaded Bragg-grating (BG) structure, is proposed. The manipulations of the pulses are carried out, using nonlinear effects, in a chirped BG segment which is linked, via a defect, to a uniform grating. The storage of the ultrashort pulses is shown to be very robust with respect to variations of the input field intensity,

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**Direct femtosecond pulse compression with miniature-sized Bragg cholesteric liquid crystal**[Article](#) [Full-text available](#)

Dec 2013

 Song Liyan ·  Shenhe Fu · Yikun Liu · [...] · I. C. Khoo

Direct compression of femtosecond optical pulses from a Ti:sapphire laser oscillator was realized with a cholesteric liquid crystal acting as a nonlinear 1D periodic Bragg grating. With a 6- $\mu\text{m}$  thick sample, the pulse duration could be compressed from 100 to 48 femtoseconds. Coupled-mode equations for forward and backward waves were employed to simulate the dynamics therein and good agreement between theory and

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**Deterministic quasi-random nanostructures for photon control**[Article](#)

Oct 2013

 Emiliano R Martins ·  Juntao Li · Yikun Liu · [...] ·  T.F. Krauss

Controlling the flux of photons is crucial in many areas of science and technology. Artificial materials with nano-scale modulation of the refractive index, such as photonic crystals, are able to exercise such control and have opened exciting new possibilities for light manipulation. An interesting alternative to such periodic structures is the class of materials known as quasi-crystals, which offer unique advantages such as richer Fourier

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**Efficient Excitation of Gap Plasmon Polaritons via Higher-Order Propagating Modes**[Article](#)

Sep 2013

Yongzhu Chen · Li Li ·  Xiangsheng Xie ·  Jianying Zhou

Efficient excitation of gap plasmon polaritons (GPPs) in an aluminum tapered gap is numerically investigated. Surface plasmon polaritons (SPPs) are efficiently excited via higher-order propagating modes by fabricating a pair of grooves on the internal surface of the tapered gap and the SPPs then be coupled into GPPs in the tip region. The physical mechanism and influence of the critical structure parameters such as groove location,

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**Image restoration through thin turbid layers by correlation with a known object**[Article](#) [Full-text available](#)

May 2013

Hexiang He · Yefeng Guan ·  Jianying Zhou

A method to recover the image of an object behind thin turbid layers is developed by wavefront shaping technique. The optimized wavefront is generated by modulating the scattering light of a known object with a spatial light modulator. A Pearson Correlation Coefficient is introduced as a cost function for the optimization. A beam scanning method based on optical memory effect is proposed to further enlarge the Field-of-View

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**Nanofocusing via Efficient Excitation Surface Plasmon Polaritons in a Hollow Aluminum Wedge**[Article](#) [Full-text available](#)

May 2013

Yongzhu Chen ·  Xiangsheng Xie · Li Li ·  Jianying Zhou

Efficient nanofocusing down to a few nanometers in a hollow aluminum wedge is numerically investigated. The waveguide propagation modes are efficiently converted to internal surface plasmon polaritons via a pair of grooves fabricated at the inner surface of the wedge and a remarkable field enhancement is realized at the aperture. The excitation efficiency can be further improved by optimizing spatial wavefront modulation of the

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**Minimized spot of annular radially polarized focusing beam**[Article](#) [Full-text available](#)

Apr 2013

Liangxin Yang ·  Xiangsheng Xie ·  Sicong Wang ·  Jianying Zhou

We have experimentally demonstrated the measurement of a tighter focal spot generated by a radially polarized narrow-width annular beam with the double-knife-edge method. The reconstructed spot profiles indicate that sharper focus cannot be achieved by shrinking the annular aperture

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**Image recovery behind turbid layers by correlation with an identified object**[Conference Paper](#)

Apr 2013 · Novel Techniques in Microscopy

Hexiang He · Yefeng Guan ·  Jianying Zhou

The image of an object behind turbid layers is recovered from speckles by an adaptive phase control technique assisted with Pearson correlation coefficient from a reference image, and hence image recovery fidelity is substantially improved.

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**Three-dimensional measurement of a tightly focused laser beam**[Article](#) [Full-text available](#)

Feb 2013

 Xiangsheng Xie · Li Li ·  Sicong Wang · [...] ·  Jianying Zhou


The spatial structure of a tightly focused light field is measured with a double knife-edge scanning method. The measurement method is based on the use of a high-quality double knife-edge fabricated from a right-angled silicon fragment mounted on a photodetector. The reconstruction of the three-dimensional structures of tightly focused spots is carried out with both uniform and partially obstructed linearly polarized incident light

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**Efficient color routing with a dispersion-controlled waveguide array**[Article](#) [Full-text available](#)

Feb 2013

Yi-Kun Liu · Si-Cong Wang ·  Yongyao Li · [...] · Thomas F. Krauss


Splitting white light into its constituent spectral components has been of interest ever since Newton first discovered the phenomenon of color separation. Many devices have since been conceived to achieve efficient wavelength separation, yet a large number of applications, e.g., in display technology, still use simple color absorption or rejection filters that absorb or reflect unwanted wavelengths, thus wasting luminous energy. Here,

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**2D supercell binary gratings for light trapping in photovoltaics**[Conference Paper](#)

Nov 2012 · Optical Nanostructures and Advanced Materials for Photovoltaics

Emiliano R Martins · Juntao Li · Yikun Liu · [...] · T.F. Krauss

We demonstrate the 2D supercell concept for light trapping in photovoltaics and numerically show enhanced light absorption compared to an optimised 2D simple grating.

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**Conditions of Perfect Imaging in Negative Refraction Materials with Gain**[Article](#)

Nov 2012

Haowen Liang · Yifeng Shao · Jianying Zhou · [...] · Gershon Kurizki

Light propagation is analyzed in a negative refraction material (NRM) with gain achieved by pumping. An inherent spatial “walk-off” between the directions of phase propagation and energy transfer is known to exist in lossy NRMs. Here, the analysis is extended to the case where the NRM acts as an active material under various pumping conditions. It is shown that the condition for perfect imaging is only possible for specific

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**Fabrication large area photonic crystals with periodic waveguide by one-step holographic lithography based on spatial light modulator**[Article](#)

Oct 2012

Yongchun Zhong · Jie Ma · Kam Sing Wong · [...] · Jianying Zhou

A one-step introduction of functional defects into a photonic crystal (PC) is demonstrated. By using a multi-beam phasecontrolled holographic lithography and a diffracting optical element, large area one dimensional (1D) and two dimensional (2D) PCs with periodic waveguide were fabricated. The uniform area is up to 4 mm<sup>2</sup>, and tens of waveguide have been introduced in the one dimension and two dimension PC structure.

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**Engineering gratings for light trapping in photovoltaics: The supercell concept**[Article](#)

Jul 2012

Emiliano R Martins · Juntao Li · Yikun Liu · [...] · T.F. Krauss

The question of the optimal surface structure for light trapping is widely debated in thin-film solar cell research. Here we propose a generic design approach that can tailor the strength of the diffraction orders of a periodic structure. Our approach is based on a supercell geometry that is able to suppress the low orders that do not couple into the quasiguidded modes of the thin film. We demonstrate the concept theoretically and

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**APPLICATIONS OF SUBMILLIMETER WAVEGUIDE TO LASER-MODE SELECTION AND NONLINEAR OPTICS**[Article](#) [Full-text available](#)

Apr 2012

Jianying Zhou · Q. X. Li · H Z Wang · [...] · Z. X. Yu

Use of submillimeter waveguide for laser transverse mode control, four-wave parametric frequency conversion, ultrafast broadband radiation generation and optical pulse shortening are presented. This paper begins with a general introduction to the applications of submillimeter waveguide to laser physics and nonlinear optics. Transverse mode selection by using an intracavity capillary is then described. Nonlinear optical

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**Manipulating spatial light fields for micro- and nano-photonics**[Article](#)

Apr 2012

Xiangsheng Xie · Yikun Liu · Mudong Zhang · [...] · Kam Sing Wong

Spatial properties of a light field, including its amplitude, polarization and phase distribution, can be modulated via spatial light modulators, digital mirror devices, optical mask, waveplates or diffraction optic elements. In conjunction with additional optical components, e.g., optical lenses or

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**Fabrication of large-size photonic crystals by holographic lithography using a lens array**[Article](#)

Mar 2012

Bing Liang · Yikun Liu ·  Juntao Li · [...] · Kam Sing Wong




Holographic fabrication of large-size photonic crystals with a lens array is proposed and demonstrated. A substantial increase of the usable size for two-dimensional and three-dimensional photonic crystals is obtained compared with the template prepared with a mask and a single-lens system.

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**Transmission enhancement in a non-adiabatic tapered nano-aperture waveguide**[Article](#)

Jan 2012

Yongzhu Chen ·  Xiangsheng Xie ·  Yongyao Li ·  Jianying Zhou


Transmission enhancement via transverse mode control through an aluminum hollow tapered waveguide with a sub-100 nm aperture is simulated with optical wavefront modulations via a binary optical element. Efficient delivery of an input field by exciting the fundamental propagating mode near the apex is realized, giving rise to a significant transmission enhancement through the nano-tip.

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**Fabrication of Large Area Photonic Crystals with Periodic Defects by One-Step Holographic Lithography**[Conference Paper](#)

Jan 2012 · Lasers and Electro-Optics (CLEO), 2012 Conference on

 Yongchun Zhong · Jie Ma · Zhe Chen · [...] · Kam Sing Wong

A one-step fabrication of a photonic crystal (PC) with functional defects is demonstrated. Using multi-beam phase-controlled holographic lithography with a diffracting optical element, large area one dimensional (1D) and two dimensional (2D) PCs with periodic defects were fabricated. The uniform area is up to  $2\text{mm}^2$ , and tens of defect channels have been introduced in the 1D and 2D PC structure. This technique

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**Performance of Large Period Engineered Grating for Solar Cell Applications**[Conference Paper](#)

Nov 2011 · Optical Nanostructures and Advanced Materials for Photovoltaics

 Emiliano R Martins ·  Juntao Li · Yikun Liu · [...] · Thomas F. Krauss

We study engineered large period gratings for thin-film silicon solar cells. Numerical calculations indicate that such gratings outperform conventional gratings over a wide range of wavelengths, incident angles and for both polarizations

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**Growth and optical properties of  $(\text{Yb}_{3-x}\text{Y}_x)\text{Al}_5\text{O}_{12}:\text{Ce}^{3+}$  single crystals**[Article](#)

Nov 2011

 Jiu-ping Zhong · Chunmeng Liu ·  Hongbin Liang · [...] · Jiyang Wang

To improve the infrared emission of  $\text{Yb}^{3+}$  ions doped in the garnet host  $\text{Y}_3\text{Al}_5\text{O}_{12}$  (YAG) single crystal through the energy transfer from  $\text{Ce}^{3+}$  to  $\text{Yb}^{3+}$  ions, the  $\langle 111 \rangle$ -oriented YAG: $\text{Ce}^{3+}$ , YAG: $\text{Yb}^{3+}$ , YAG:( $\text{Ce}^{3+}$ ,  $\text{Yb}^{3+}$ ) and  $\text{Yb}_3\text{Al}_5\text{O}_{12}:\text{Ce}^{3+}$  (YbAG: $\text{Ce}^{3+}$ ) single crystals were grown using the Czochralski Method, respectively. The excitation and emission spectra of these garnet single crystals were characterized. In YAG: $\text{Ce}^{3+}$  crystal, the

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