

Antonio (Tony) A.D. Cañas Wilkinson

Web: www.acanas.co.uk

Statement

I am best described as a cross between a scientist and an engineer. I enjoy an environment where there is a chance to turn theoretical ideas into practical realisations, especially with an interdisciplinary flavour. I also enjoy the challenge of extracting useful information from a noisy signal in an optimum manner, possibly using new algorithms and mathematical methods.

I am seeking a situation in which I can organise, manage, interact with and enthuse a group of engineers / scientists / technicians; I would like to be able to act as a technical lead and technical authority in such a group. I also enjoy acting in a technical consultancy role.

Employment History

- (2008 – present) **Chief Engineer**, Oxford Nanopore Technologies. Algorithm development for novel DNA sequencing technology, detailed noise analysis, writing system simulations in C. Specification of a custom application-specific integrated circuit (ASIC) for signal amplification and supplier selection / liaison. Integration of electrochemical data into noise analysis. Originating novel system architectures for optimal efficiency (patented) and specifying custom hardware for signal processing by implementation in FPGA. Appraisal and characterisation of commercial signal acquisition systems. Running a small team of engineers.
- (2004 – 2008) **Senior System Engineer**, Perkin Elmer. R&D of laboratory instrumentation, new concepts and technologies. Involved spectroscopy, fluorescence, optics and optical design, interferometry, electronics, signal processing, mechanical and magnetic design, some bio-assay work, drug discovery systems. Technology awareness, generation of novel designs and proposals, feasibility work, algorithm design, expert testing, transfer to production, test specifications. Generation of patents and IP. Customer demonstrations. Requirements gathering.
- (2000 – 2004) **Technical Director**, Chelsea Technologies Group. Design of marine sensing instruments including military / homeland security systems. Life-science instrumentation including new assay technologies and point-of-care test readers to customer specifications. Customer-facing role as well as R&D and technical leadership. Technologies including LEDs, magnetics, fluorescence, optical detection, firmware, micro-controller system design, sonar, transducer design, precision measurement and calibration. Design consultancy, prototype and pilot production. Optical design and testing.
- (1999 – 2000) **Research Scientist**, Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder. Calibration and characterisation of the SIM (Solar Irradiance Monitor instrument), part of the SORCE mission launched in 2003 and still operational.
- (1994 – 1999) **Research Fellow**, Natural Environment Research Council. Design, construction, calibration and operation of Tropospheric Airborne Fourier-Transform Spectrometer (TAFTS) on the Meteorological Research Flight's C-130 Hercules aircraft for the purpose of measuring the contribution to global warming of long-wave infra-red water vapour emissions around the tropopause. Included mechanical, optical, electronic and signal processing design and implementation, as well as black body design for calibration. Design of polarising four-port

interferometer and non-imaging optical concentrators. Cryo-systems (helium and nitrogen) for detector mounting, and cryogenic optical system design.

- (1984 – 1994) **Lecturer in Physics and Applied Optics**, Imperial College, London. Teaching at undergraduate and postgraduate levels as well as research projects. Special emphasis on practical work, including running the laboratory segment of the Applied Optics MSc Course. Taught image processing and interpretation for geologists (including field work) as part of the University of London course on remote sensing. Research in spectroscopic instrumentation, remote sensing, image processing, astronomical instrumentation, optical computing and detectors. Research on optimal spectroscopic measurements and characterisation of visible and near-IR absorption spectra of water vapour to very high quality resulting in additions to the HITRAN database.

Research & Development Experience

I have both academic and industrial research and development experience:

- Originating a practical system architecture for novel DNA sequencing system, including detailed noise analysis / signal quality assessment, design of signal processing algorithm, failure modes and effects analysis, end-to-end system simulation in C and specification of special-purpose hardware for signal processing. Specification and design of a isposable precision fluidics system.
- Specification of a custom Application-Specific Integrated Circuit (ASIC) for multi-channel (512) very-low-noise (2 pA RMS) current amplification at high speed (20 kHz). Vendor selection and technical liaison with selected overseas vendor. Includes involvement in sensor - amplifier sub-assembly interconnection and thermal issues.
- Optical and mechanical design of a novel fast-pulsed fluorimeter (FRRF-II) for detection of phytoplankton photosynthesis. Originated a new sensor geometry with very high optical efficiency and small volume capable of operation to 1000m depth. Applications to oceanography, global warming and homeland security.
- Development of an accessory for an infra-red imaging microscope that would permit “Attenuated Total Reflection” imaging of “difficult” samples: detailed germanium optical design, mechanical design, liaison with suppliers, design of production processes / jigs, defining production test procedures, writing applications notes and training in support of sales specialists and customer demonstrations. Spectral image processing algorithms (principal components analysis). Several patents.
- Design of a new laboratory / commercial FT Spectrometer including market / competitor research, user requirements capture, proposing a new system architecture, design of a new skew-symmetric interferometer and scan mechanism based upon flexures, magnetic actuator design and construction and servo system simulation, reflective optical system design, signal processing scheme (using Brault-resampling, implemented in C).
- Detailed laboratory measurement of water vapour spectral absorption strengths in the near infra-red using Fourier-transform spectroscopy as an aid to global climate modelling. Work carried out in Molecular Spectroscopy Facility in Rutherford Laboratory on 10m White cell.

Involved modification, improvement and alignment of Bruker IFS120 interferometric spectrometer with custom detectors and electronic filters and re-calibration. This work contributed many hitherto unknown weak absorption lines to the HITRAN database.

- Design, construction and calibration of a new airborne long-wave infra-red Fourier-transform spectrometer (TAFTS). I was responsible for the optical, electronics and signal processing algorithm design and implementation (in C) and much of the mechanical design. I also constructed and programmed the control computer using real-time Linux.
- Research into non-imaging optical concentrators and their use in portable radiometers, well-plate readers, far-IR spectrometers.
- Design, development, testing and production of novel equipment for military oceanographic measurement, including origination of new production and calibration procedures and software (in C) and direct customer liaison. Also design of a novel ship-born data display unit and management of its implementation as a sub-contractor. Involvement in Sonar 2112 / 2115 / 2081.
- Optical, electronic and thermal design of a system for multiple-channel DNA amplification / measurement by fluorimetric polymerase chain reaction (PCR). Optical optimisation, system test and calibration, close customer liaison. Use of non-imaging concentrators with custom-moulded sample tubes to optimise fluorescence signal (patented) with very high efficiency.
- Development of a fluorescence micro-reader for multiple antibody micro-spot assays (200 micron sample spots on a 600 micron pitch). Demonstrated that the use of modulated LED illumination and polarisation filtration could produce results equivalent to those obtained by a commercial laser imaging scanner at a fraction of the cost and size but with no speed penalty. System concepts patented.
- Development and testing of a novel algorithm for removing smear from CCD images recorded in a luminescence-assay high-throughput drug discovery system (patented). Implemented in C and incorporated into instrument control software.
- Design and construction of a portable heterodyned holographic Fourier transform spectrometer for measuring visible and near-IR spectral reflectance of vegetation in the field.
- Holography for display and measurement applications, holographic optical elements.

Practical Skills

- System Engineering: rapid technical appreciation of a new project.
- Technical troubleshooting in a wide variety of disciplines. Rapid technical fixes.
- Excellent presentational, writing and communications skills, including customer-facing.

I

- Design of experiments, analysis of results including custom algorithms. Estimation of noise and signal levels, measurement of signal quality.
- Instrumentation design: optics, signal detection, electronics, mechanical, thermal, materials selection, magnetics and signal processing.
- Technology awareness in diverse fields.
- Independent research / information gathering / initiative.
- Optical design using ZEMAX, especially in non-sequential mode and high-efficiency optical concentration. Optical assembly and test.
- Optical detectors including photo-multipliers, solid state, (visible, UV and IR), detector arrays, CCDs, infra-red.
- Basic use of Pro-Engineer for solid mechanical modelling and drafting. Autocad for drafting. Can also use a pencil for sketching!
- Electronics – especially low-noise analogue, digital, micro-controller system design, high-resolution ADC and pre-amplifiers, some RF design, transmission line theory, Smith charts, impedance matching.
- Signal Processing algorithms and associated mathematics.
- C language programming / PC construction / Linux system set-up / some real-time Linux experience.
- Transfer of new systems / components / sensors into production, including jigs, procedures for production, test & calibration. Origination of new production processes. Use of resins and adhesives.
- Technical project management and small engineering group leadership in the role of technical authority.

Education

- ◆ Imperial College, London, 1977 to 1980: BSc first class honours in Physics and Associateship of the Royal College of Science. Tyndall prize for Practical Physics.
- ◆ Imperial College, London, 1980 to 1983: PhD in Applied Optics (Image Processing) and Diploma of the Imperial College.

Recent Training

- ◆ Frost & Sullivan management skills training course (2007).
- ◆ “Results-based leadership” course (at Perkin Elmer)
- ◆ Simulink control system modelling (Mathworks, Cambridge, 2007)

- ◆ Embedded Linux and Altera NIOS short courses

Teaching Experience

- ◆ Undergraduate-level lecturing and tutoring in various aspects of physics (especially electronics, communications, control, optics, signal processing) with practical emphasis. I received some of the highest teaching ratings in Imperial College.
- ◆ Post-Graduate level lecturing, practical work and research student supervision.
- ◆ Contributions to the Applied Optics Summer School (held at Imperial College) for several years – a 10-day course designed for industrial engineers to gain or refresh skills in optics.
- ◆ Invited lecturer on the SIRA Optical Engineering I and II industrial training courses.

Professional Membership

- ◆ Member of the Institute of Physics (MInstP)
- ◆ Chartered Physicist (CPhys)
- ◆ Chartered Engineer (CEng)
- ◆ Member, Radio Society of Great Britain.

General Interests

Light-aviation (PPL/ IMC), amateur radio (G4ZLZ), archery, wine-making, DIY, bread-baking, making PC systems with Linux, dogs, kayak building. Issues surrounding disability in children (especially speech, cerebral palsy), access to treatment and provision of services, educational support.