



## Martin Joseph Dudziak PhD

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§ *Scientist* - accomplished research investigator, project manager, corporate executive and director, experienced in academic, corporate, non-profit and non-governmental organizations and programs; extensive background in both theory and application, within diverse cultural, international and multi-disciplinary communities.

§ *Subject matter expert consultant* - analyst and specialist with expert witness legal experience - topics span interdisciplinary STEM areas including (i) physics (theoretical, nuclear, particle, condensed matter), (ii) biophysics (neuromuscular and cardiovascular topics - dysautonomia, arrhythmia, autoimmune and inflammatory diseases), (iii) computer science and engineering (software and electronic systems, artificial intelligence, internet, social networks), (iv) biomedical engineering (nanotech, antimicrobials, sensors) and (v) chemical-biological-radionuclide risks (defense, security, contamination, transport).

§ *Counsellor* - analyst, advisor and mentor to individual and corporate/organizational clients, serving as a facilitator of solutions for executive management within organizations and for individuals and families with new or evolving enterprises and projects including requirements for adaptation, relocation, transition, distribution.

**Research background** -- full CV, select publications and excerpts, resumes, bios: <http://tdyn.org/martindudziak>

### **Professional Employment Experience**

§ 2018 - Present: Chairman and Chief Technology Officer, [Intelligence Renaissance Industries](#) (IRI)

A multi-function business encompassing several operational units with scientific and technological focus. These include commercialization of research outcomes deriving from prior work by partners and acquired ventures, within multi-spectral sensor and monitoring systems, robotics, remote telecommunications, and a broad suite of information and cybersecurity technologies. Responsibilities include executive leadership and direct program and project management. Refer to <http://intelrenaissance.com>.

§ 2006 - Present: Scientific Director, [TETRAD Institute of Complex System Dynamics](#) (formerly known as Institute for Innovative Study).

The institution consists of theoretical investigations and experimental research involving a globally distributed network of collaborative researchers. Areas of activity span foundational physics, cybernetics and robotics, synthetic intelligence, and STEM+health education and training. Responsibilities include direct research, communication, teaching, and leadership. Specific and direct projects include reflexive topological dynamics (theoretical physics), neuroplex (neuromuscular and cardiovascular stress and trauma investigations and diagnostics development), quantum computing foundations and architectures, and psychosocioeconomic models pertaining to non-linearity, uncertainty, risk, and catastrophe phenomena. Refer to <http://tdyn.org>.

§ 2003 - 2016: Chief Scientist, [TETRADYN Ltd. \(TETRAD Group\)](#)

Development of sensing, imaging, and recognition methodologies for (principally) closed-system and environmental health threat detection/abatement applications. Focus upon inverse and nonlinear models and algorithms including applications of quantum computing (QC) models using conventional systems and instruments with objectives of implementing QC in future versions. Analytical instrumentation included GC/MS, FTIR, XRF, AFM, Raman, HPLC, AA and radiation spectroscopy.

R&D in intelligent control, sensing, imaging and actuator response, principally chem/bio/rad and human-machine interfaces: **CEBIT** (Chemical-Explosives-Biological Identification and Tracking), **Nomad Eyes** (distributed CEBIT-based situation awareness, early warning and response network) and **CUBIT** (Coordinated Unified Biothreat Intervention and Treatment). Other collaborative sensor work has involved nucleic acid amplification techniques (PCR) and immunoassay with optical waveguides, with focus on pandemic early threat detection and abatement.

Responsible for distributed technical and scientific team management, proposal/bid development, business plan components, project management, product evaluation (technical and market/customer acceptance). Experienced in setup and management of new lab/center environments, procurement, clinical trials planning and logistics, business planning including spin-outs and new ventures, new team formation, public presentations and communications. Refer to <http://tetradyn.tdyn.org>.



§ 2001 - present: Visiting/Adjunct Professor, (multiple accredited institutions, USA, EU, RU – refer to full CV)

Graduate & undergraduate teaching (maths, physics, humanities, computer/information science, medical informatics); student advising & mentoring; curriculum & program development (applied biomedical science and informatics, mathematics, computer science, health information technologies). Collaboration-development with corporate, academic and public institutions. Currently teaching and mentoring graduate students (PhD level study).

§ 2000 - 2003: Group Manager and Research Lead, Intel Corporation

Responsible for consortium-based research activity with regional (Costa Rica and Latin America) scientific institutions (CENAT, FUNDES, LANAMME) and also with Russia as part of corporate new business development. Research focused upon nanomaterials and microfluidic MEMS technologies. Managed two separate and distributed international teams. Established and directed nanotechnology lab in San Jose in conjunction with CENAT) for quantum dot and graphene investigations; key application projects were a MEMS-based mass-spec analyzer and a biosensor based upon carbon nanotube assemblies. Served as analyst/advisor for Intel Capital VC investment division.

§ 1996 - 2001: CEO and Director of R&D (Co-Founder), Silicon Dominion Corporation, Richmond, VA

Directed development efforts of startup R&D company, producing products in two areas:

- (a) Nanostructured materials and technologies – focus on controllable quantum dots, magneto-optic sensing, carbon nanotube fabrication and array structuring, and modeling tools for micro/nano-materials applications including EMF-based sensing and system diagnostics;
- (b) Internet-based research and research-collaboration tools. Products included Open Stream Media and Open Net Tool Suite (medical and emergency-response oriented software and networks), and MODE (magneto-optics-based sensing and measurement). MEMS-based molecular sensing R&D led to platform of molecular-scale detectors.

§ 1993 - 1998: Assistant/Associate Professor, Physics and Biomedical Engineering (dual appointments), Virginia Commonwealth University (Medical College of Virginia), Richmond, VA

Full-time; founded and directed Molecular Engineering and Biocomputing Center (MEBC lab). Research focus on theory (quantum computing and algorithms) and applications of nonlinear models and complex systems (cellular automata, attractors) to biological signaling and nanosystems. Developed genetic-algorithm and neural-net models. Research in quantum solitonic (tensegriton) models, macroscopic quantum effects (biosolitons), nanostructured materials, and experimental work on intracellular submicron imaging using in vitro neural cell cultures. Also implemented a pioneering internet-based telemedicine information resource and medical informatics network linking U.S. hospitals & companies with foreign institutions.

§ 1988 - 1993: Senior Scientist, Special Projects, SGS-THOMSON Microelectronics (now ST.com), Baltimore MD (Concurrent 1991-1992: Visiting Faculty, VA Tech & Radford Univ.)

Introduced use of AFM and STM for defect and fault analysis. Designed prototype development of real-time parallel processing and also a pattern recognition (neural net) processor chip for object recognition and microcontrol. One focal area was in addressing error tracking and correction within very large parallel systems used in satellite, rocket and missile systems. Core neural chip was later applied to pattern recognition. Led and served on team and task group for prototyping, training on new microprocessor and image processing devices. Established corporate-university joint research project for signal processing including research in brain hologram and quantum biology models. Concurrently worked on PhD studies and dissertation.

§ 1985 - 88: Senior Engineer / Project Manager, Martin Marietta Aerospace (now Lockheed-Martin), Baltimore MD

Designed and implemented autonomous and guided robots and manipulators. Established artificial intelligence lab for autonomous robot R&D. Designed first motion and obstacle-avoidance controller for Navy deep-sea autonomous underwater robot, employing sonar and lidar. Served as liaison/consultant to partner companies and govt. agencies on sensor, data fusion, recognition. Performed software R&D and management concentrating in artificial intelligence and neural networks. Research activities included application of quantum-theoretic models for macroscopic environments and large-scale MIMD parallelism.

§ 1983 - 85: Research Scientist, Artificial Intelligence Group, Battelle Labs, Columbus OH

Designed and implemented rule-based, neural-net and other nonlinear AI expert systems, simulations and development tools for medically-related fault-diagnostics, process control and qualitative physics. Developed set-theoretic based relational DBMS and architecture for data mining and knowledge extraction over sensor-actuator networks. Co-PI on project to develop artificial intelligence models for use in analysis of technology databases and system diagnostics data streams (fault control and monitoring of nuclear power and defense systems).



### § 1981 - 83: Research Scientist, Artificial Intelligence Group, Comshare Inc., Ann Arbor MI and London UK

Worked as member of the Ron Jeffries Group on development of set-theoretic database architectures and AI-based decision support and financial model projections. Designed and implemented early version of WWW (web framework for HTML-type internet multimedia communications and collaborative teleoperations) employing RETE logics and simulated-annealing neural network models.

### **Formal Higher Education**

- § BA (high honors), dual-major (Philosophy+Physics), Colgate University, Hamilton, NY
- § Postgrad program in computer science at UCSB and UCLA, Los Angeles, CA
- § MA, Philosophy of Physics (concentration: quantum logics) Johns Hopkins University, Baltimore, MD
- § PhD, Theoretical and Computational Physics, Union Institute and University, Cincinnati, OH (1993)  
 “Quantum Processes and Dynamic Networks in Physical and Biological Systems”  
 (doctoral advisors: D. Finkelstein\*, D. Bohm\*, B. Hiley\*, R. Penrose, K. Sharpe\*, J. Crain\*)

### **Selected Long-Term (including Applied-System) Projects**

- Current and most recent work (post 2017): **Reflexive Topological Dynamics** (theoretical physics), **Neuroplex disorders (dysautonomia, arrhythmia, autoimmune, inflammatory)** (medicine - etiology and diagnostics), **Topological Orders in Synthetic Intelligence** (computer science and mathematics). **OASIS** (public health - social intelligence media and communications).  
 Refer to <http://tdyn.org>, <http://intelrenaissance.com> and <http://arc.tdyn.org>.
- **PodAtrium** and **Bio-Study-Lab** (modular systems for robotic and human use – earth, undersea, space)
- **CyberMod** and **CUBIT** (analytical chemistry and diagnostics instrumentation; multi-spectral design)
- **BioProt** (analysis, surface bioprotection treatment, monitoring, and training of workers, students, general-public, for preventive measures against a variety of contact/exchange-transmissible pathogens; expanded to collaboration with a clinical team that has developed superior bioprotection for in-body post-op bioprotection re: orthopedic surgery and implant devices/procedures)
- **CUBIT, CRAIDO and Race-to-Resilience** (community-centric rapid-response including modular mobile system for biothreat validation, intervention and treatment coordination; primary case study for H5N1, expanded for H1N1 and H7N9, with emphasis on mutation detection & tracking, epidemiological monitoring, social behavior analysis supporting social resilience)
- **Nomad Eyes** (chem-bio-rad-threat focused network for detection, recognition, assessment, alert, and response, geared for civilian populations, adapted to influenza and food/water-borne epidemics- both home/institutional use; stochastic distribution, wireless and cellular devices; redesigned and upgraded for functionality with generic smartphones and tablets)
- **RedBioNet** (focus on early-warning biothreat detection in wildlife and rural/uninhabited environments, employing distributed sensor arrays and mixed-media information gathering from local including public sources)

**Selected Publications and Invited Presentations** (refer to <http://tdyn.org/martindudziak> and full CV documents)

**Courses Taught at University (G=Graduate) Level** (refer to <http://tdyn.org/martindudziak> and full CV documents)

**International Qualifications** (refer to <http://tdyn.org/martindudziak> and full CV documents)

### **Language Proficiency**

English (native); also Russian, German, Spanish, plus limited skills in some others.

### **Personal Contact Data**

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### **Principal Websites**

<http://arc.tdyn.org> (ARC - encompassing TETRAD Institute, IRI and derivative ventures)

<http://tdyn.org>

<http://intelrenaissance.com>

<http://tdyn.org/martindudziak>