Contents

Forward
Vacuum: Means of Production, Measurement and Applications

Part 1: Tutorial and Education
Part 1A: Concepts
Leaks: The Good, the Bad and the Ugly 1-2
The Speed of Sound, Shock Tubes and Potato Cannons 1-10
How Fast do Little Particles Fall in Vacuum? 1-21
Cartesian Divers: Clever Physics Demo, Toy and Pressure Gauge 1-22
From Cartesian Divers to PID Pressure Control 1-28
Part 1B: Sputtering
Sputtering Basics 1-35
Simple Sputtering Apparatus and Procedures from Early Publications 1-38
Simple Sputter Apparatus 1-41
Edison's Sputtering Patent 1-44
On the Electro-Chemical Polarity of Gases 1-47
Part 1C: Education
HVAC Vacuum Pump, Manifold & Chambers 1-57

Part 2: Vacuum Hardware
A Home Made Sprengel Pump 2-2
High Vacuum with Mechanical Pumps 2-4
The Editor Rebuilds His Vacuum System 2-7
A Puff Piece: Single shot and repetitive pulse valves 2-13
Design Differences in Thermocouple Vacuum Gauges 2-18

Part 3: Vacuum Applications
Part 3A: More on Microwave Ovens
In Praise of Junkery 3-2
Scientific Apparatus Using Domestic Microwave Ovens 3-4
Part 3B: Projects with Microwave Ovens
Quick Drying of Woodturnings 3-7
Microwave Plasma Reactor Update 3-8
Part 3C: Plasma Chemistry, Freeze Drying & Other Applications
A Small Reactor for Plasma Polymerization 3-10
Frozen Free Radicals 3-18
Plasma Ashing 3-20
Freeze Drying: The art of prolonging the life of dead stuff 3-23
Two Freeze Drying Chambers 3-29
Homemade Propane Refrigeration System 3-32
A High Altitude Chamber for Biological Studies 3-36
Part 3D: Coaxial Plasma Accelerators
Mini-F: A Small Plasma Focus Device 3-40
Materials Modification with the Coaxial Plasma Gun 3-45

Part 4: Mass Spectrometers, Discharge Tubes and Beam Devices

Part 4A Mass Spectrometers

Home Built Mass Spectrometers 4-2

Part 4B: Discharge Tubes, Ion & Electron Beams and Plasma Devices

Discharge Tube Experiments with AC Potentials 4-11
Those Cool Bands in the Positive Column 4-12
An X-Ray Tube Prototype 4-14
An X-Ray Tube 4-17
Three Simple Vacuum Tube Projects 4-18
New Experiments on the Kathode Rays Jean Perrin 4-22
A Functional Thomson *e/m* Apparatus 4-24
Magnetic Deflection of Electrons using Vacuum Tubes 4-27
More on the Pseudospark Electron Source 4-29
Plasma Topics: Probing the glow discharge, the Thomson spectrometer, nuclear tracks 4-34
The Umac 606 Phantasatron (spoof) 4-45

Part 5: Neutron Generators

Neutrons and Neutron Generators 5-2
Crossed Field Neutron Source 5-11
The Farnsworth/Hirsch Fusor 5-21
More on Richard Hull's Fusor 5-29
IEC Update: Fusor Commercialization and New Applications 5-31
More IEC Patent Activity from George Miley & Co.: Fullerenes and X-Rays 5-37