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Gas Breakdown, Low Current diffuse discharges, Townsend's theory: A Friday afternoon experiment ZORAN PETROVIC, Institute of Physics University of Belgrade — Numerous aspects of the "standard model" of gas breakdown have been addressed in the past 20 years by Art Phelps and his coworkers. First, his studies of excitation coefficients were carried out in the Townsend regime where electric field is quasi uniform so swarm like conditions prevail. These studies have been extended to very high E/N where non-hydrodynamic effects were to be observed but were overshadowed in most cases by fast neutral excitation. Absolute calibration of emission provided a basis to obtain fast neutral cross section sets. This work necessarily overlapped with the left hand side of the Paschen curve and in extension of an ill fated data gathering experiment a review was made of all the processes that contribute to the secondary electron emission. It was shown that, if one includes all the processes, it is possible to fit the available breakdown data, Paschen curves and effective electron yields by binary collision data obtained in separate experiments. While performing measurements in the low current diffuse (Townsend) regime one can find negative differential resistance and oscillations. Both were explained by taking detailed information on properties of particles close to the cathode and small perturbations to the local field by the growing space charge. Last but not the least Phelps managed, with his coworkers to provide a phenomenology and predictions of the anomalously broadened profiles often observed in various discharges. In all those cases deep knowledge of atomic and molecular physics and of gas discharges were combined with best available data to produce quantitative (quantitative, quantitative) agreement with experiments. Coworkers: Dragana Maric. Supported by MPNTR project ON171037 and SANU project 155.

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