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Excitations of the Nucleon –N* spectroscopy with CLAS

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Baryon spectroscopy began in 1952 with the discovery of the first Δ resonance by Fermi and collaborators. By the mid-1980s a sizeable collection of resonances had been identified in pion-Nucleon scattering, and particle physics left this field for higher-energy pastures, confident that a basic understanding of the Nstar spectrum was at least close, if not exactly in hand. With time, refinements of the quark model provided a systematic ordering to the observations but, annoyingly, predicted the existence of many more states than had been observed, which lead to speculations of mechanisms that restricted the degrees of freedom. Only recently (2011) have theoretical advances finally allowed a direct computation of the nucleon spectrum in Lattice-QCD, with the startling confirmation of large numbers of "missing"excited states. With the advent of new facilities, the last decade has seen a renaissance of sorts in photo-meson production experiments, in which polarization has been used to constrain the production amplitudes to a degree not achieved in π+N reactions, and a great many new Nstar candidates are emerging. The additional flexibility in the 4-momentum transfer has been used with electron scattering to probe the excitation process and the role of the meson cloud. Highlights in the context of the CLAS N* spectroscopy program at Jefferson Lab will be reviewed.

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