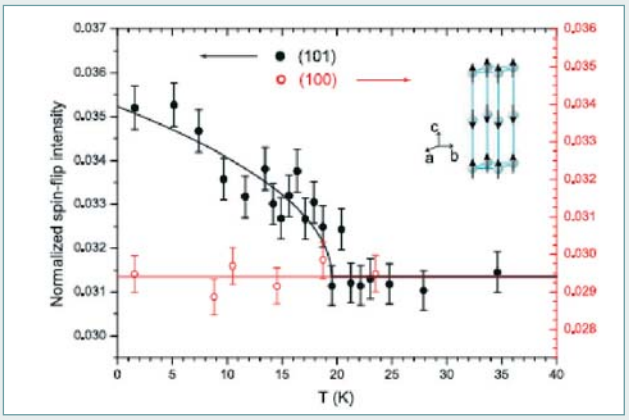
[*C1*. S. P. Bayrakci] Magnetic Ordering and SpinWaves in $Na_{0.82}CoO_2$

Na_xCoO_2, the parent compound of the recently synthesized superconductor $Na_xCoO_2=(H_2O)_y$, exhibits bulk antiferromagnetic order below ~20 K for 0.75 < *x* < 0.9, y = 0. We have performed neutron scattering experiments on a $Na_{0.82}CoO_2$ single crystal and observed for the first time Bragg reflections corresponding to A-type antiferromagnetic (AF) order (i.e. ferromagnetic *ab*-planes antiferromagnetically coupled along the *c* axis). The magnetic order is characterized by magnetic moments directed along *c** axis, causing the elastic neutron scattering cross section to vanish for purely magnetic Bragg reflections such as ***Q*** = (0,0,1) (see figure). On other Bragg reflections, both nuclear and magnetic signals are superimposed, and polarized neutron scattering technique becomes essential to extract the weak magnetic signal. After calibrating the magnetic intensity measured for Q = (1,0,1) against the intensity of the (1,0,0) nuclear peak, we could extract a value of the ordered magnetic moment equal to 0.13 ± 0.02 mB per Co atom. The observation of transverse magnetic excitations along the c* direction was comparatively straightforward and the results can be perfectly described by the standard spin-wave theory. However, both the weakness of the ordered magnetic moments and the damping of the spin-wave excitations suggest that $Na_{0.82}CoO_2$ may correspond to an itinerant magnetic system.

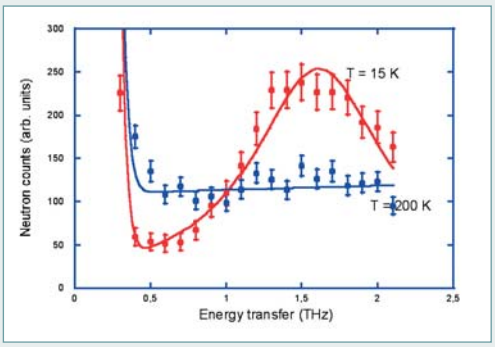
[Collaboration : S. P. Bayrakci, B. Keimer, D. P. Chen, C. T. Lin, MPI Stuttgart – I. Mirebeau, Ph. Bourges, Y. Sidis, LLB – M. Enderle, ILL – J. Mesot, PSI]

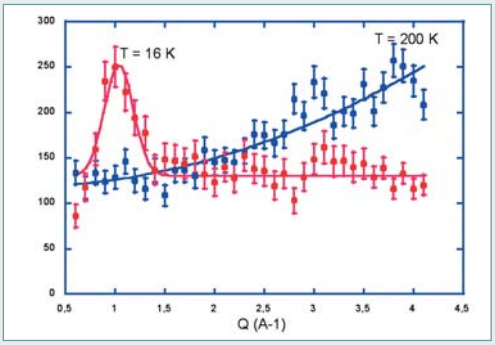


S. P. Bayrakci et al., Phys. Rev. Lett. **94**, 157205 (2005)

Normalized spin-flip intensity for ***Q*** = (1,0,1) and (1,0,0) plotted as a function of temperature. The data were taken with the neutron polarization ***P*** // ***Q***, at an incident neutron energy of E_i = 14.7 meV. The lines are guides to the eye. Inset: *A*-type AF structure, represented with Co spins // *c*

[*C2*. O. Mentré] Spin gap in the one-dimensional S = 1/2 spin-ladder compound $Bi_2Cu(P_{1-x}V_x)O_6$





Spin ladders, spin-Peierls, or more generally dimer-chain systems have proven to be a very rich subject because of their essential quantum nature, at the crossroad between one and two dimensions. $Bi_2Cu(P_{1-x}V_x)O_6$ belongs to this new interesting class of materials. The analysis of its crystallographic structure shows that the copper ions, carrying an *S* = 1/2 spin, form zigzag two-legs ladders running along the *c* axis, with rungs parallel to the *b* direction. Two adjacent ladders are separated by nonmagnetic Bi ions and PO_4 and VO_4 groups, depending on the substitution level *x*. These PO_4 and VO_4 groups strongly affect the competition between magnetic couplings along the legs, along the rungs, and between adjacent ladders, leading in turn to different ground states. These structural properties are closely related to the spin dynamics. The evolution of the spin susceptibility as a function of temperature is typical of a spin-gap system for *x* < 0.7, while this spin-gap behaviour is lost for 0.7 < *x* < 1 . Inelastic neutron scattering measurements performed on powder samples with *x* = 0, 0.6, 0.9, and 1 enabled us to directly measure this spin gap for *x* = 0 and 0.6. The figures show typical w scans performed at fixed Q = 1 $Å^{-1}$ [above], and typical ω scans performed at fixed energy transfer ω = 1.5 THz (6 meV) [under]. Cooling down to 15 K unambiguously shows the appearance of dynamical correlations peaked around Q = 1 A^{-1}, which corresponds to half the distance between copper spins. Further investigations on single crystals are planned to improve the description of the magnetic response.

[Collaboration : O. Mentré, F. Leclercq Hugueux (LPCS, ENSCL, Villeneuve d'Ascq) S. Petit, M. Hennion (LLB)]