FGK stars harbor exoplanets within 20 AU. The median orbital eccentricity is <e>=0.25 (excluding those tidally circularized), lower than previously measured . Planets orbiting beyond 3 AU continue to exhibit non-zero eccentricity, suggesting that the circular orbits of giant planets in our Solar System are unusual. The occurrence rate of ``hot Jupiters'' within 0.1 AU is 1.2±0.3 %. The probability of occurrence of planets varies as the square of the stellar metal abundance, $P \propto N^2_{Fe}$, ranging from <3% for stars of subsolar metallicity to 25% for stars with [Fe/H] > +0.3. Nearly 14% of planet-bearing stars harbor multiple-planet systems, occasionally locked in resonances. Kepler and Corot should measure the occurrence of earth-sized planets. The Space Interferometry Mission (SIM) will detect planets with masses as low as 3 M Earth orbiting within 2 AU of nearby stars and will measure masses, orbits and multiplicity. These candidate rocky planets will motivate spectroscopic follow-up by the ``Terrestrial Planet Finder'' and Darwin.

OBSERVING DARK ENERGY

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Several independent observations suggest that the Universe is flat and it consists of three main ingredients: atoms, Dark Matter and a mysterious Dark Energy, which causes an acceleration of the cosmic expansion. The talk will address some open questions: Are the observations sufficiently accurate? Is the model unique? What is the nature of the Dark Matter and the Dark Energy? Future large surveys such the "Dark Energy Survey" and WFMOS will be presented. Finally, the sociology and the 'globalisation' of the New Cosmology will be discussed.

THE COROT PROJECT: FROM DREAM TO REALITY

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CoRoT (**Co**nvection, **Ro**tation and planetary **T**ransits) is a space experiment dedicated to ultra high precision, wide field, relative stellar photometry, for very long (up to six months), continuous observing runs on the same field of view. It has two main scientific programs working simultaneously on adjacent regions of the sky: asteroseismology and search for extrasolar planets. The first aim is to

detect oscillations in a large variety of stars and to classify the asteroseimologic properties of distinct objects in the HR diagram and a more specific one, centered on detailed studies of a few bright stars. The detection of a telluric planet is a major challenge and is expected as the next big step in astronomy. CoRoT will use the occultation method or transit method, which allows to precisely determine the orbital period and the size of the planet and is not hampered by the severe bias of the Doppler method. CoRoT will be launched in October, 2006 from the Baikonur Space Center in Khazakhistan, by a SOYUZ rocket. I will present the history of the project, the long way from the first proposal in 1993 to a final decision in 2000. I will then discuss the scientific programme, as it has been defined to built the instrument. Then I will describe the different phases of the development of the hardware, now ready for launch. Finally I will show how the foreseen observing programme will fulfill the scientific goals.

A PHENOMENOLOGICAL REVIEW OF GAMMA RAY BURSTS

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The study of Gamma-Ray Bursts (GRBs) is one of the hottest topics in modern astrophysics. Considered to be a mysterious phenomenon since its discovery in the late sixties until the identifications of X-ray, optical/IR and radio counterparts in the late nineties, these explosive events are now well observed by a host of X and Gamma-ray space missions, especially the HETE-2 and Swift satellites. Major advances have been achieved over the last few years on our understanding of GRBs. The long events (durations ~ tens of seconds) seem to be associated to the deaths of massive, fast rotating stars in high-redshift, star-forming galaxies, with a few bursts being clearly connected to *hypernovae* (energetic core-collapse type-Ic SNe). The favored model for these events includes internal shocks in beamed relativistic ejecta originated during the collapse of the star to a black hole. The origin of short (~ hundreds of milliseconds) GRBs is less clear, but the model in which they are originated by mergers of compact objects have recently gained strong support by HETE-2 and Swift observations and follow-up optical identifications. GRBs also have a high potential for playing an important role in cosmology, inasmuch as they uniquely probe the high redshift universe. Attemps to use GRBs as standard candles by which cosmological parameters of the early universe can be derived are underway and look very promising. In this talk I will review the phenomenology of these enigmatic events and will discuss the impact of GRB science to astrophysics and cosmology.