

CERN Council Strategy Group LAL Orsay views

Guy Wormser

LAL Orsay director

May 2, 2006



UNIVERSITÉ
PARIS-SUD 11

CERN Council Strategy group
Zeuthen meeting, May 2



Very brief LAL Orsay presentation

- LAL Orsay is the **largest CNRS/IN2P3** laboratory devoted to particle physics and cosmology
- **100 physicists, 220 Engineers and technicians**
- Annual consolidated budget: **20 M€**
- **Strong implication** in HEP experiments across the world with **large technical contributions**
- Not more local accelerators but **many accelerator R&D activities**



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In LAL, we strongly believe in the huge discovery potential in the period 2006-2010!

- Key fundamental questions
 - The origin of mass
 - The composition of the Universe
 - The disparition of anti-matter
 - The mysterious properties of the neutrino
- New very powerful tools to shed light on all these
 - LHC starting next year ([ATLAS](#), [LHCb](#))
 - [AUGER](#) having now its first large data set
 - [NEMO3](#), [BABAR](#), [D0](#), [H1](#) with vastly increased statistics
 - [VIRGO](#) getting close to its nominal sensitivity
 - [PLANCK](#) soon ready for launch
 - [OPERA](#) soon ready for beam (horns made in LAL)
 - [ILC](#) detector R&D in full swing

LAL Accelerator R&D program

- Two « Niches » of excellence
 - Power Couplers for SC cavities
 - VUV-FEL à DESY (30+30)
 - XFEL (3 contracts with industry : TOSHIBA, ACCEL, E2V)
 - ILC-GDE
 - High current, low emittance photoguns
 - CTF3 drive beam and probe beam
 - PITZ collaboration
 - Plasma driven acceleration
 - Radiotherapy
 - Accelerator for chemistry
- Strong implication in GDE
 - Power couplers
 - BDS/MDI activities (beam-beam simulation, background studies, instrumentation)
 - 4 GDE members : T. Garvey, F. Richard, P. Bambade, P. Royole-Degieux
- CARE/EUROTev/EuroLEAP/EUROFEL member



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The scientific priorities

Short term

- 1) Finish the construction , installation and commissioning of the large experiments (ATLAS, LHCb, PLANCK). Prepare the tools needed for the physics exploitation (EGEE/LCG Tier2 Site)
- 2) Exploit in the best possible manner the experiments with very high discovery potential such as BABAR, D0, NEMO, VIRGO, AUGER
- 3) Continue to play a key role in the global effort around the International Linear Collider project (machine and detector)

Longer term

- To be defined in more detailed in the « Prospective 2010» effort (May 22-24, 2006)
- Extract the LHC results and prepare future upgrades
- Play a key role in Linear Collider construction and detector collaboration
- Prepare the next round of top class projects (Super-xxx)



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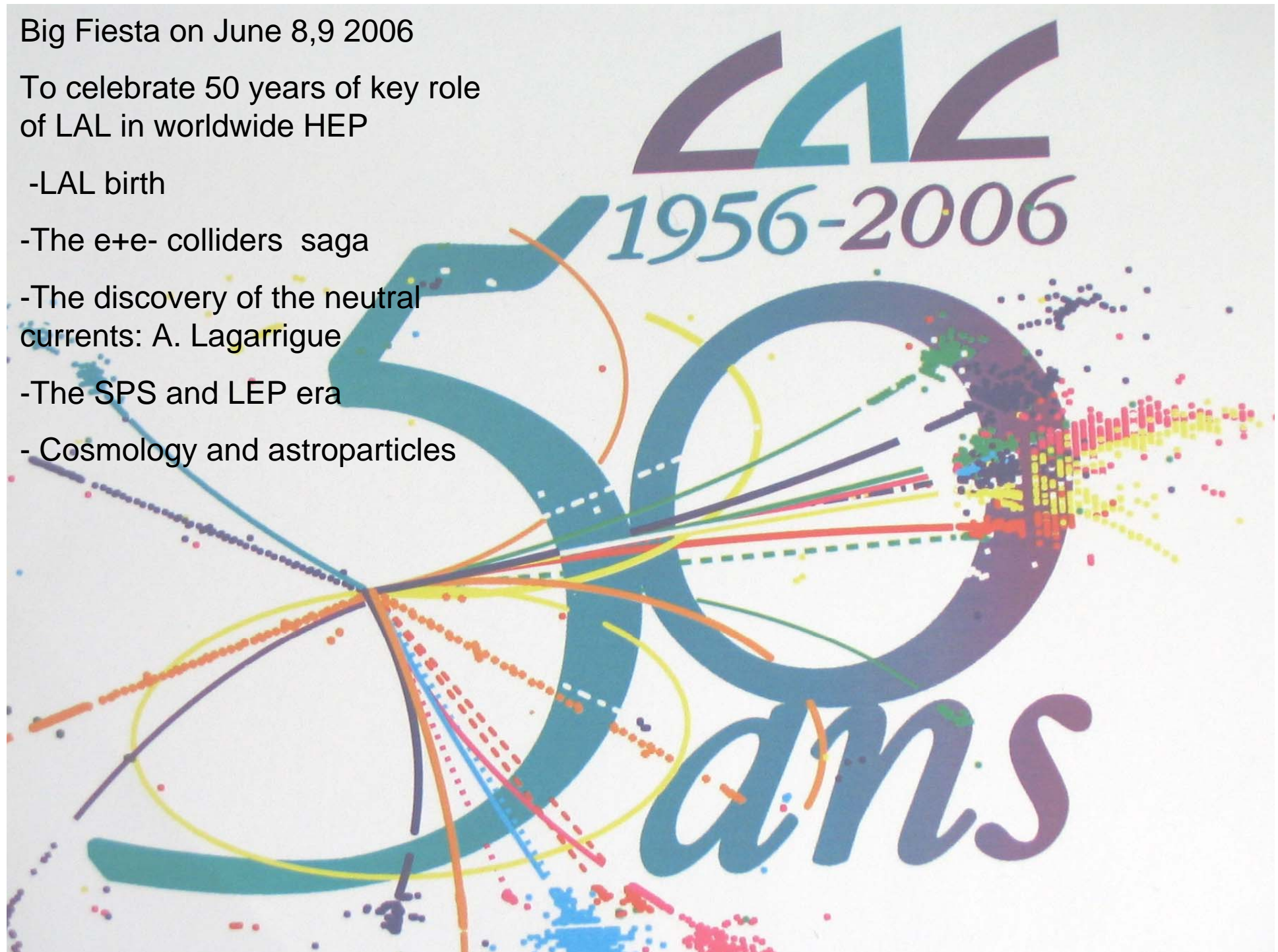
LAL physicists have a tradition of having responsibilities in France or abroad

- IN2P3 directors: P. Lehmann, B. D'Almagne
- IN2P3 deputy directors: L. Jauneau, J. Haissinski, J.P. Repellin, B. D'Almagne, GW, F. Le Diberder
- Chef du Dapnia heads: P. Lehmann, J. Haissinski
- CERN SPC chair: J. Lefrançois
- CERN SPC members : J.P. Repellin, M. Davier, J. Lefrançois, D. Fournier
- CERN committees chair: J. Haissinski (LEPC), B. D'Almagne (SPSC)
- International collaboration spokesperson: J. Lefrançois (ALEPH), J.E. Augustin (DELPHI)
- ILC-WWS co chair : F. Richard
- US HEPAP member : GW

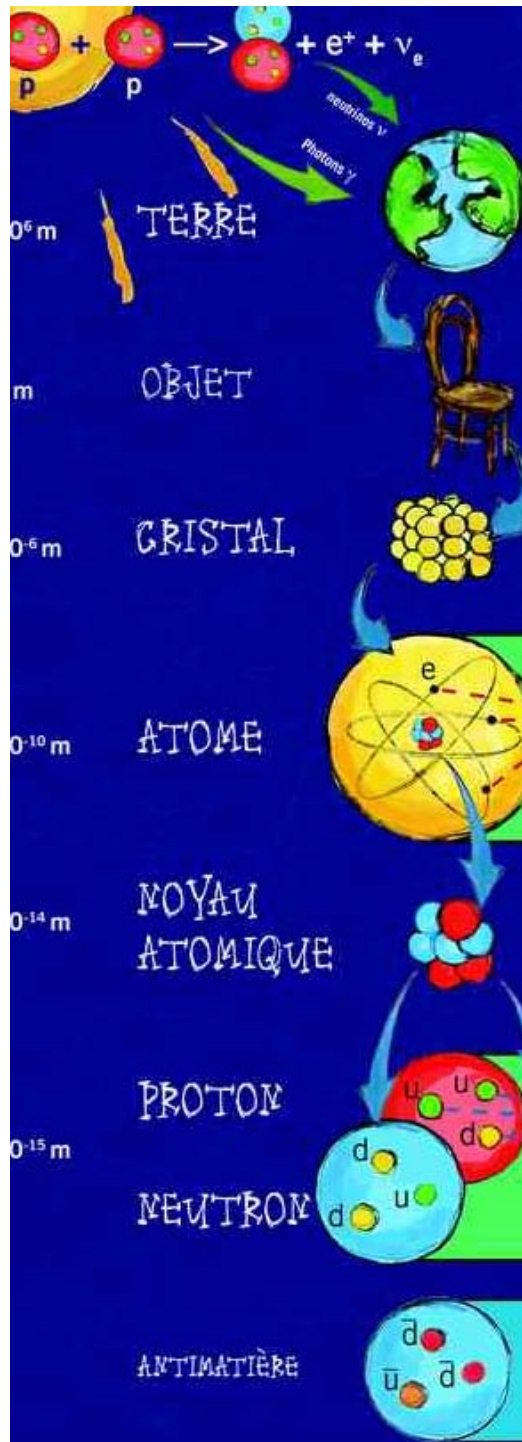
Big Fiesta on June 8,9 2006

To celebrate 50 years of key role
of LAL in worldwide HEP

- LAL birth
- The e+e- colliders saga
- The discovery of the neutral
currents: A. Lagarrigue
- The SPS and LEP era
- Cosmology and astroparticles



Composants élémentaires de la matière



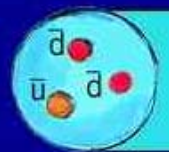
	1 ^{re} famille	2 ^e famille	3 ^e famille
	Les membres de la 1 ^{re} famille composent l'essentiel de la matière ordinaire (protons, neutrons, atomes...)	Répète plus massive et instable de la 1 ^{re} famille. Le muon est ainsi 200 fois plus lourd que l'électron.	Répète encore plus massive et instable de la 1 ^{re} famille. Le tauon est ainsi 3500 fois plus lourd que l'électron.
LEPTONS	e électron <small>m = 9,109 381 87 × 10⁻³¹ kg q = -1,602 176 46 × 10⁻¹⁹ C</small>	μ muon <small>m = 1,88 × 10⁻²⁸ kg</small>	τ tau <small>m = 1,77 × 10⁻²⁷ kg</small>
Particules insensibles à l'interaction forte.	ν_e neutrino e <small>m = 0</small>	ν_μ neutrino muon <small>m = 0</small>	ν_τ neutrino tau <small>m = 0</small>
QUARKS	u haut / up <small>m = 2,3 × 10⁻²⁸ kg</small>	c charm / charm <small>m = 1,67 × 10⁻²⁷ kg</small>	t top <small>m = 1,73 × 10⁻²⁶ kg</small>
S'assemblent en triplets ou en paires quark-antiquark pour former les nombreuses particules subatomiques.	d bas / down <small>m = 1,9 × 10⁻²⁸ kg</small>	s étrange / strange <small>m = 2,9 × 10⁻²⁸ kg</small>	b beau / beauty / bottom <small>m = 4,18 × 10⁻²⁷ kg</small>

Les interactions fondamentales

Il existe des **PARTICULES ASSOCIÉES** aux interactions fondamentales permettant leur propagation.

- Gravitation**
Attraction universelle, planètes, galaxies.
GRAVITON?
- Interaction faible**
Désintégrations radioactives.
Z⁰, W⁺, W⁻
- Interaction électromagnétique**
Électricité, magnétisme, cohésion de l'atome et du cristal, chimie.
PHOTON
- Interaction forte**
Cohésion des protons et des noyaux.
GLUON

ANTIMATIÈRE



À chaque particule correspond une antiparticule aux propriétés quasi-identiques. La charge électrique d'une antiparticule est l'opposé de la particule correspondante.



- Les 4 forces fondamentales sont indispensables au fonctionnement du soleil (et des étoiles) :
- formation de l'étoile causée par la gravitation;
 - réactions de fusion nucléaire avec l'interaction faible et forte;
 - production de lumière: interaction électromagnétique.

Les 4 particules de la première famille sont présentes dans le soleil qui envoie sur la terre un flux intense de photons et de neutrinos.

A great success in France and abroad

- This poster, an initiative born in LAL and supported by LAL, has been officially delivered to all physics classes of all French high schools (20000 posters). Very positive feedback so far
- 500,000 pupils will admire it almost every day during 3 years. The hope is of course to disseminate basic knowledge of the subatomic world, to raise their scientific curiosity and to generate a few vocations!
- Very large success abroad as well
 - Canada has already deployed it in the same way (5000 english posters, 1000 French ones)
 - English, German, Dutch and Romanian version are available
 - <http://sfp.in2p3.fr/affiche>
 - A version has been made for Michigan State University
 - CERN has ordered a thousand
 - NIKHEF has decided to deploy it in the Netherlands
- The poster is now clickable to go one level deeper and explain full story of each particle or concept



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LAL Orsay views on European Strategy (I)

- Very exciting discoveries in particle physics, cosmology and astroparticle physics are awaiting around the corner. New clues will be obtained on the mechanism giving mass to elementary particles, the electroweak interaction symmetry breaking, dark matter composition, structure and evolution of the Universe... Action must be therefore vigorously taken using in the most effective manner all the world capabilities in our field.
- LHC must be started on time. Its superb physics potential should be exploited as fully as possible. An aggressive upgrade program must be conducted once the essential messages concerning the physics and the running environment will have been digested. High field magnets R&D, necessary for both luminosity and energy upgrades must be vigorously pursued.

LAL Orsay views on European Strategy (II)

- The world-wide agreed priority for the ILC, to build a new e+e- collider in two phases (500 GeV and 1 TeV later) as quickly as possible using the supraconducting RF technology should be reiterated in a crystal clear manner.
- No undue delay concerning the first phase whose scientific case is already outstanding, should occur.
- The approval for this machine should be independent from CLIC R&D progress, which must be pursued vigorously in parallel to be able to explore in due time the multiTeV region.
- Concerning the machine siting, all countries or regions should be encouraged to bid for this machine and special attention should be given to a well balanced world wide HEP program.



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LAL Orsay views on European Strategy (III)

- Other areas in the physics program which will lead to discoveries quite complementary to those investigated at the LHC and the ILC **must be pursued with the best of our abilities.**, taking the best advantage of national or regional opportunities wherever available to boost this program. The **most promising fields in that respect are neutrino physics, flavour physics and cosmology/astroparticles.** LAL took note regarding the latter topic that a strategy document is also in preparation under the APPEC aegis.

Conclusion

- LAL Orsay is very active on many fields and hopes to contribute to major discoveries in a very short future
- LAL Orsay strongly believes that the future of our field, together with the LHC, lies with the ILC that should be built as soon as possible.
- LAL Orsay believes that we should take advantage of all local opportunities to continue push forward research in astroparticles, neutrino and flavour physics.



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