Summary of Session 3

- Feynman Diagram Calculations (automatization)

- Event Generators

- Analytical Approaches to FDC

- Mathematical innovations

First talk of the session does not fit quite into this scheme !

• Brainstorming

J. Vermaseren : The rules of Physics

Cross fertilization between perturbative field theory and write programs for go

- Rules of Physics: derive reduction equations by integration by parts, symmetry $\cdots$: order of 1000ds.

- Rules of go: set single stones to 'kill' and gain domain $\rightarrow$ corresponds to elimination of indices.

Automatization of Feynman Diagram Calculation

- Wang: FDC drawer; MSSM realized in 1999; partialwave analysis for high spin states; effective meson theory; supersymmetry; automatic construction of Feynman rules.

- J.F.: DIANA

- Riemann: Bhabha-project

- Jegerlehner: two-loop SE's, all renormalization counterterms for $2 \rightarrow 2$ fermions.

- GRACE:

- Jimbo: Automatic 1-loop Calculation of MSSM Processes with GRACE involved in the SPA Project (SUSY Parameter Determination, Montpellier Nov. 14) Asia: GRACE/SUSY, SUSY processes with up to 6 external particles: 582,102 processes.

- Kato: 5-point functions with GRACE.

Event generators

- **CompHEP:** newest version 4.4

- **Boos:** CompHEP based event generators for colliders. Different topologies

- **Kryukov:** hashed (#) processes:

  u#,d# → u#,d# : ud → ud, cd → ud, cd → cd, ⋯

  (= 1 subprocess)

  and distribution.

- **Was:** Observables with τ leptons at LHC and LC. Higgs boson Yukawa coupling expressed with the help of the scalar-pseudoscalar mixing angle Φ : $NH\bar{\tau}(\cos\Phi + i\sin\Phi)\tau$.

- **Accomando:** Six-fermion physics at the LHC with PHASE.

Analytical approaches to FDC

- Tarasov: Application of Groebner basis method to evaluation of Feynman diagrams.

- Blümlein: Mathematical Structure of QCD Wilson Coefficients and Anomalous Dimensions.

Mathematical innovations

- Doncker: Loop integration results using numerical extrapolation and symbolic manipulation. On the basis of the "ϵ-algorithm" a method to calculate 1-loop Feynman diagrams is developed, extrapolating to $\epsilon = 0$.

- Tkachov: POUZYRY: a new class of algorithms for modelling a function from a random sample. Based on the mathematical concept of weak convergence an algorithmical mehod is developed for the construction of an adaptive MC integrator. POUZYRY='Buble' can locate peaks of a distribution quite well.

- Serdyukova: Potential Reconstruction for Two-Dimensional Discrete Schrödinger Equation. A discrete Schrödinger equation with a nonlocal five-point potenial is considered. Applications in statistical mechanics.

- Zeitlin: Nontrivial Quantum Patterns: Zoo of the Solutions of Wigner-Moyal Equations. Localization and pattern formation in Quantum/Statistical physics. Quantum physics in the Wigner-Weyl framework.

- Robuk: A constructive formula for the function matrix (Alternative to the Lagrange-Silvestre formula). An alternative for the LS formula is developed, which avoids certain drawbacks of the original formula.

- Glazunov: Categorification of Fourier Transforms, Efficient Computation and Computing Intelligence. The talk illustrates the consequences of the category theory treatment for data representation, scientific computations and computing intelligence. Optimization of computer algebra problems are discussed.

- Konash: Numerical experiments with ground on AED-theory. The object-oriented language 'Delphi' is used to describe various physical effects: the Fabri-Perot Interferometer with chaotic beaviour, processes of percolation in heterogeneous systems and the migration of energy in disordered media.