LATTICE 92
Proceedings of the International Symposium on Lattice Field Theory
Amsterdam, The Netherlands
15–19 September 1992

Edited by
J. Smit
Institute for Theoretical Physics
University of Amsterdam
The Netherlands

and

P. Van Baal
Institute for Theoretical Physics
University of Utrecht
Instituut-Lorentz
University of Leiden
The Netherlands

NORTH-HOLLAND
CONTENTS

Preface v
Committees and sponsors vi

Part 1. Plenary talks

1.1. Reviews

QCD spectroscopy
   A. Ukawa 3
Weak matrix elements
   C.T. Sachrajda 20
Heavy quark physics
   P.B. Mackenzie 35
Chiral gauge theories and fermion-Higgs systems
   D.N. Petcher 50
Finite temperature QCD: Lattice '92 review
   B. Petersson 66
Analytic results – lattice and continuum
   M. Salmhofer 81
Progress in lattice field theory algorithms
   A.D. Kennedy 96
Simplicial gravity and random surfaces
   J. Jurkiewicz 108
A review talk about computers and theoretical physics
   E. Marinari 122

1.2. Special and general interest talks

Determination of the running coupling in the SU(2) Yang–Mills theory from first principles
   M. Lüscher, R. Narayanan, R. Sommer, P. Weisz and U. Wolff 139
D-dimensional induced gauge theory as a solvable matrix model
   V.A. Kazakov 149
Protein folding: Structure prediction and statistical mechanics
   M. Fukugita 159
Finite-size scaling of the mass gap for first-order phase transitions
   C. Borgs 168
Monopoles and confinement
   T. Suzuki 176
Percolation theory and the existence of a soft phase in 2D spin models
   A. Patrascioiu and E. Seiler 184
Visual study of zero-modes role in PTMG convergence
   M. Harmatz, P. Lauwers, S. Solomon and T. Wittlich 192
## Contents

### Cosmology in 2+1 dimensions
- G. 't Hooft 200

### Lattice gas hydrodynamics
- B.M. Boghosian 204

## Part 2. Parallel talks

### 2.1. Analytic results

- **Problems with the quenched approximation in the chiral limit**
  - S.R. Sharpe 213

- **The quenched approximation in health and in sickness**
  - C. Bernard and M. Golterman 217

- **Renormalizability of the critical limit of lattice gauge theory by BRS invariance**
  - D. Zwanziger 221

- **Lattice gauge theory in terms of independent Wilson loops**
  - R. Loll 224

- **Gauge fixing and Gribov copies in Pure Yang-Mills on a circle**
  - J.E. Hetrick 228

- **The exact mass gap of the chiral SU(n)×SU(n) model**
  - S. Naik 232

- **A new method to generate large order low temperature expansions for discrete spin models**
  - G. Bhanot 236

- **Critical properties of the exact density of states for discrete systems**
  - J. Wosiek 239

- **Three-loop results on the lattice**
  - B. Allés, M. Campostrini, A. Feo and H. Panagopoulos 243

### 2.2. Algorithms

- **On the dynamics of light quarks in QCD**

- **Autocorrelations in updating pure SU(3) lattice gauge theory by the use of overrelaxed algorithms**

- **Multigrid for propagators of staggered fermions in four-dimensional SU(2) gauge fields**
  - T. Kalkreuter 257

- **Parallel-transported multigrid (PTMG) for inverting the Dirac operator in SU(3) lattice gauge theory**
  - R.G. Lauwers and T. Wittlich 261

- **Theoretical analysis of acceptance rates in multigrid Monte Carlo**
  - M. Grabenstein and K. Pinn 265

- **Multigrid meets neural nets**
  - M. Bäker, G. Mack and M. Speh 269

- **Multicanonical cluster algorithm**
  - K. Rummukainen 273

- **The loop-cluster algorithm for the case of the 6 vertex model**
  - H.G. Evertz and M. Marcu 277
Blockspin scheme and cluster algorithm for quantum spin systems
U.-J. Wiese and H.-R. Ying 281

Multimagnetical simulation of the Ising model
U.H.E. Hansmann 285

Framework and properties of cluster algorithms
W. Kerler 289

2.3. Computers
QCD teraflops computer
J.W. Negele 295

New parallel computer project in Japan dedicated to computational physics
Y. Oyanagi 299

Reducing communication inefficiencies for a flexible programming paradigm
M. Fischler, M. Gao, G. Hockney, M. Isely and M. Uchima 301

2.4. Thermodynamics of gauge theories
Dimensional reduction of QCD and screening masses in the quark gluon plasma
P. Lacock and T. Reisz 307

QCD with 2 light quark flavors: Thermodynamics on a 16^3 \times 8 lattice and glueballs and
topological charge on a 16^3 \times 32 lattice
K.M. Bitar, R. Edwards, S. Gottlieb, U.M. Heller, A.D. Kennedy, S. Kim, J.B. Kogut, A. Krasnitz,
K.C. Wang 315

Baryon density correlations in the quark plasma
C. Bernard, TA. DeGrand, C. DeTar, S. Gottlieb, A. Krasnitz, R.L. Sugar and D. Toussaint

Eight-flavor QCD
N.H. Christ 323

Quark confinement in multi-flavor Quantum Chromodynamics
Y. Iwasaki, K. Kanaya, S. Sakai and T. Yoshie 327

QCD thermodynamics at N_f = 8
R.D. Mawhinney 331

The quark correlator at finite temperature
G. Boyd 335

The behaviour of the Lee–Yang zeros for SU(3) and compact U(1)
I.M. Barbour, A.J. Bell, E.G. Klepfish, R. Burioni, A. Vladikas and G. Salina 339

Scaling and asymptotic scaling in the SU(2) gauge theory
J. Fingberg, U.M. Heller and F. Karsch 343

A straightforward way to evaluate some critical parameters in SU(2) lattice gauge theory
J. Engels 347

The degrees of freedom in hot quenched QCD
S. Gupta 351

Properties of gluon plasma bubbles
M.C. Ogilvie 354

Real-time hadron properties at finite temperature from an euclidean lattice
S. Huang 358
2.5. QCD Spectroscopy

Origin of the finite-size effect for the QCD hadron masses
M. Fukugita, H. Mino, M. Okawa, G. Parisi and A. Ukawa 365

Finite size effects on the QCD spectrum revisited

Study of spatial size effect in quenched Wilson hadron spectroscopy at $\beta = 6.3$
K. Akemi, Ph. de Forcrand, M. Fujisaki, T. Hashimoto, H.C. Hege, S. Hioki, O. Miyamura,
A. Nakamura, M. Okuda, I.O. Stamatescu, Y. Tago and T. Takaishi 373

Infinite volume, continuum limit of valence approximation hadron masses

Hadron spectrum of quenched QCD on a $32^3 \times 64$ lattice
S. Kim and D.K. Sinclair 381

Quenched light hadron spectroscopy: comparing the Wilson and O(a)-improved fermion actions
UKQCD collaboration, A.D. Simpson 385

Charmed meson spectroscopy and matrix elements with an O(a)-improved clover fermion action
UKQCD collaboration, D.G. Richards 389

Gauge invariant smearing and the extraction of excited state masses using Wilson fermions at $\beta = 6.2$
UKQCD collaboration, S. Collins 393

Contamination of excited states in quenched QCD hadron propagators

Hadron spectroscopy with dynamical Wilson fermions at $\beta = 5.3$
K.M. Bitar, T.A. DeGrand, R. Edwards, S. Gottlieb, U.M. Heller, A.D. Kennedy, J.B. Kogut,
K.C. Wang 401

Hadron masses on a $32^4$ lattice at $\beta = 5.7$
W. Schaffer 405

Wave functions and their use in spectroscopy and phenomenology
T.A. DeGrand and M.W. Hecht 409

2.6. Weak interaction matrix elements

Weak matrix elements with gauge invariant Kogut-Susskind operators
N. Ishizuka, M. Fukugita, H. Mino, M. Okawa, Y. Shizawa and A. Ukawa 415

Meson form-factors and wave-functions with Wilson fermions
R. Gupta, D. Daniel and J. Grandy 419

Renormalisation of lattice currents and the calculation of decay constants for dynamical staggered fermions
R. Altmeyer, K.D. Born, M. Göckeler, R. Horsley, E. Laermann and G. Schierholz 423

Nucleon and Hyperon electromagnetic transitions
T. Draper, D.B. Leinweber and R.M. Woloshyn 427

2.7. Heavy quark systems

Properties of low-lying heavy-light mesons

Heavy-light wavefunctions in lattice QCD
A. Duncan, E. Eichten and H. Thacker 441
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The charm quark on the lattice</td>
<td>445</td>
</tr>
<tr>
<td>A.S. Kronfeld</td>
<td></td>
</tr>
<tr>
<td>The charmonium spectrum on the lattice: A status report</td>
<td>449</td>
</tr>
<tr>
<td>A.X. El-Khadra</td>
<td></td>
</tr>
<tr>
<td>Results in the static approximation</td>
<td>453</td>
</tr>
<tr>
<td>C. Alexandrou, S. Güsken, F. Jegerlehner, K. Schilling and R. Sommer</td>
<td></td>
</tr>
<tr>
<td>Hopping parameter expansion for heavy-light systems</td>
<td>457</td>
</tr>
<tr>
<td>UKQCD collaboration, D. Henty</td>
<td></td>
</tr>
<tr>
<td>A comparison of an O(a)-improved and the Wilson fermion actions at $\beta = 6.0$ for heavy-quark systems</td>
<td>461</td>
</tr>
<tr>
<td>UKQCD collaboration, J. Simone</td>
<td></td>
</tr>
<tr>
<td>Results for $f_B$ and $f_D$ at $\beta = 6.3$</td>
<td>465</td>
</tr>
<tr>
<td>C. Bernard, J. Labrenz and A. Soni</td>
<td></td>
</tr>
<tr>
<td>Preliminary results from APE-100</td>
<td>469</td>
</tr>
<tr>
<td>Calculating the Isgur–Wise function on the lattice</td>
<td>473</td>
</tr>
<tr>
<td>C.W. Bernard, Y. Shen and A. Soni</td>
<td></td>
</tr>
<tr>
<td>The Isgur–Wise limit on the lattice</td>
<td>477</td>
</tr>
<tr>
<td>J.E. Mandula and M.C. Ogilvie</td>
<td></td>
</tr>
<tr>
<td>2.8. QCD other topics</td>
<td></td>
</tr>
<tr>
<td>The spin content of the nucleon</td>
<td>483</td>
</tr>
<tr>
<td>R. Altmeyer, M. Göckeler, R. Horsley, E. Laermann and G. Schierholz</td>
<td></td>
</tr>
<tr>
<td>Sea-quark effects in nucleon structure</td>
<td>487</td>
</tr>
<tr>
<td>S.-J. Dong and K.-F. Liu</td>
<td></td>
</tr>
<tr>
<td>Lattice charge overlap and the elastic limit</td>
<td>491</td>
</tr>
<tr>
<td>W. Wilcox</td>
<td></td>
</tr>
<tr>
<td>Lattice analysis of two-point hadronic correlators in the QCD vacuum</td>
<td>495</td>
</tr>
<tr>
<td>M.-C. Chu, J.M. Grandy, S. Huang and J.W. Negele</td>
<td></td>
</tr>
<tr>
<td>Fields around the static quark–antiquark pair in SU(3) with dynamical fermions</td>
<td>499</td>
</tr>
<tr>
<td>T. Barczyk</td>
<td></td>
</tr>
<tr>
<td>Fermion distribution inside the flux-tube</td>
<td>503</td>
</tr>
<tr>
<td>E. Laermann and P. Schildberg</td>
<td></td>
</tr>
<tr>
<td>2.9. Pure gauge</td>
<td></td>
</tr>
<tr>
<td>The running coupling from SU(3) potentials</td>
<td>509</td>
</tr>
<tr>
<td>UKQCD collaboration, C. Michael</td>
<td></td>
</tr>
<tr>
<td>The running coupling from SU(3) gauge theory</td>
<td>513</td>
</tr>
<tr>
<td>G.S. Ball and K. Schilling</td>
<td></td>
</tr>
<tr>
<td>Monte Carlo renormalization group study at large $\beta$ in confinement region</td>
<td>517</td>
</tr>
<tr>
<td>Glueball wavefunctions</td>
<td>521</td>
</tr>
<tr>
<td>Ph. de Forcrand and K.-F. Liu</td>
<td></td>
</tr>
<tr>
<td>Pure-gauge SU(2) on large lattices</td>
<td>525</td>
</tr>
<tr>
<td>UKQCD collaboration, P.W. Stephenson</td>
<td></td>
</tr>
</tbody>
</table>
Some physical properties of SU(2) gauge fields in three dimensions
   M. Teper 529

2.10. Gauge fixing
   The gluon propagator in momentum space
   C. Bernard, C. Parinello and A. Soni 535
   Gribov copies and other gauge fixing beasties on the lattice
   A. Hulsebos 539
   Experiencing Gribov copies in SU(3) lattice gauge theory
   S. Petrarca 543

2.11. Monopoles and confinement
   Monopoles and confinement
   E.T. Tomboulis 549
   Confinement as a dual Meissner effect, monopoles, matrix models and the unitary gauge of
   quantum chromodynamics I
   M. Bochicchio 553
   An order parameter of the confinement–deconfinement transition in the presence of dynamical
   fermions
   S. Kitahara, Y. Matsubara, S. Ohno and H. Ohkubo 557
   Can monopoles alone reproduce the string tension also in SU(2) lattice QCD?
   Monopole condensate and confinement
   T.L. Ivanenko, A.V. Pochinsky and M.I. Polikarpov 565
   Measurement of the penetration depth and coherence length in U(1) and SU(2) dual Abrikosov
   vortices
   V. Singh, D.A. Browne and R.W. Haymaker 568
   Lattice investigation of dual superconductor mechanism of confinement
   P. Cea and L. Cosmai 572
   3D SU(2) pure gauge theory in the maximally abelian gauge
   V. Bornyakov and R. Grygoryev 576
   Lattice monopoles in the Villain model
   Z. Schram and M. Teper 579
   Decoupling of photon propagator in compact QED
   K. Yee 583
   Compact U(1) lattice gauge theory with monopole suppression
   V.G. Bornyakov, V.K. Mitrushkin and M. Müller-Preussker 587
   Magnetic monopoles in non-compact QED – is there a phase transition?
   P.E.L. Rakow 591

2.12. Chiral gauge theories
   Chiral fermions on the lattice
   D.B. Kaplan 597
   Chiral fermions, anomalies and Chern–Simons currents on the lattice
   K. Jansen 601
   Staggered fermion approach to chiral gauge theories on the lattice
   W. Bock, J. Smit and J.C. Vink 605
<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A method for putting chiral fermions on the lattice</td>
<td>M. Gockeler and G. Schierholz</td>
<td>609</td>
</tr>
<tr>
<td>On reflection positive formulation of chiral gauge theories on a lattice</td>
<td>S.V. Zenkin</td>
<td>613</td>
</tr>
<tr>
<td>A streamlined method for chiral fermions on the lattice</td>
<td>G.T. Bodwin and E.V. Kovács</td>
<td>617</td>
</tr>
<tr>
<td>Anomalous fermion number non-conservation on the lattice</td>
<td>I. Montvay</td>
<td>621</td>
</tr>
<tr>
<td>Second order formalism for lattice fermions</td>
<td>J.L. Cortés, J. Gamboa and L. Velázquez</td>
<td>625</td>
</tr>
<tr>
<td>How do fermions behave on a random lattice?</td>
<td>C.J. Griffin and T.D. Kieu</td>
<td>629</td>
</tr>
</tbody>
</table>

### 2.13. Yukawa models

<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A better large $N$ expansion for chiral Yukawa models</td>
<td>G. Bathas and H. Neuberger</td>
<td>635</td>
</tr>
<tr>
<td>Chiral perturbation theory and numerical studies of Yukawa models</td>
<td>J. Sloan and J. Shigemitsu</td>
<td>639</td>
</tr>
<tr>
<td>No strong coupling regime in the fermion-Higgs sector of the standard model</td>
<td>W. Bock, C. Frick, J. Smit and J.C. Vink</td>
<td>643</td>
</tr>
<tr>
<td>Mass spectrum and bounds on the couplings in Yukawa models with mirror-fermions</td>
<td>L. Lin, G. Münster, M. Plagge, I. Montvay, H. Wittig, C. Frick and T. Trappenberg</td>
<td>647</td>
</tr>
<tr>
<td>Fermion mass and Yukawa coupling in lattice chiral Yukawa theory</td>
<td>S. Aoki and Y. Kikukawa</td>
<td>654</td>
</tr>
<tr>
<td>Fermion spectrum in the quenched U(1) chiral Wilson–Yukawa model</td>
<td>S. Aoki, H. Hirose and Y. Kikukawa</td>
<td>658</td>
</tr>
<tr>
<td>How much are 2d Yukawa models similar to Gross–Neveu models?</td>
<td>A.K. De, E. Focht, W. Franzki and J. Jersák</td>
<td>662</td>
</tr>
<tr>
<td>Chiral fermion in two dimensions?</td>
<td>W. Bock, A.K. De, E. Focht and J. Smit</td>
<td>666</td>
</tr>
<tr>
<td>Critical exponents of the 3 dimensional Gross–Neveu model</td>
<td>L. Kärkkäinen</td>
<td>670</td>
</tr>
<tr>
<td>The standard model on a Planck lattice</td>
<td>G. Preparata and S.-S. Xue</td>
<td>674</td>
</tr>
</tbody>
</table>

### 2.14. Higgs and scalar models

<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The triviality Higgs mass bound with higher derivative Lagrangian</td>
<td>K. Jansen, J. Kuti and C. Liu</td>
<td>681</td>
</tr>
<tr>
<td>Regularization dependence of the Higgs mass triviality bound</td>
<td>U.M. Heller, M. Klomfass, H. Neuberger and P.M. Vranas</td>
<td>685</td>
</tr>
<tr>
<td>Solution of $\lambda \phi^4$ on $F_4$</td>
<td>M. Klomfass</td>
<td>690</td>
</tr>
<tr>
<td>The $I = 1, J = 1$ channel of the $O(4)$ $\lambda \phi^4$ theory</td>
<td>K.M. Bitar and P.M. Vranas</td>
<td>693</td>
</tr>
<tr>
<td>Lee–Yang zeroes and logarithmic corrections in $\phi^4$ theory</td>
<td>R. Kenna and C.B. Lang</td>
<td>697</td>
</tr>
</tbody>
</table>
2.15. Aspects of electro-weak theories

The electroweak phase transition: lattice results and comparison with perturbative predictions
J. Kripfganz

Sphaleron topography
J. Ambjørn and K. Farakos

Chern–Simons term in the 4-dimensional SU(2) Higgs model
F. Karsch, M.L. Laursen, T. Neuhaus and B. Plache

On the diffusion in the sine-Gordon field theory at high temperatures
A. Bochkarev and Ph. de Forcrand

Cosmic strings on the lattice

2.16. QED

Vacuum polarization in compact QED
W. Bürger, M. Faber, H. Markum, M. Müller and W. Sakuler

Renormalization group flow in non-compact QED with two charged staggered fermions
A. Ali Khan

Finite temperature QED$_3$ with light fermions
J.B. Kogut and J.-F. Lagae

(2+1)-Dimensional compact QED with dynamical fermions
V. Azcoiti and X.-Q. Luo

New look at the critical behaviour of non compact QED with dynamical fermions
V. Azcoiti, G. Di Carlo and A.F. Grillo

2.17. Quantum gravity and random surfaces

Smooth and rough phases of quantized gravity
H.W. Hamber

Higher derivative regularization in 4D quantum gravity
C.F. Kristjansen

Measure of four-dimensional simplicial quantum gravity
B. Brügmann

Gravitational action versus entropy on simplicial lattices in four dimensions
W. Beirl, E. Gerstenmayer, H. Markum and J. Riedler

Asymptotic freedom and Regge–Einstein quantum gravity
B.A. Berg and B. Krishnan

Three-dimensional simplicial quantum gravity coupled to Ising matter
J. Ambjørn, Z. Burda, J. Jurkiewicz and C.F. Kristjansen

Ising models coupled to two and three dimensional quantum gravity
S. Catterall, J. Kogut and R. Renken

The crumpling transition revisited
M. Baig and D. Espriu
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monte Carlo simulations of 2-dimensional quantum gravity coupled to $c = 1$ matter</td>
<td>783</td>
</tr>
<tr>
<td>T. Filk, M. Marcu and B. Scheffold</td>
<td></td>
</tr>
<tr>
<td>Coupling of multiple $q$-state Potts models in 2$d$ gravity</td>
<td>787</td>
</tr>
<tr>
<td>G. Thorleifsson</td>
<td></td>
</tr>
<tr>
<td>Simulation of dynamical triangulation in 2D with higher order curvature terms</td>
<td>791</td>
</tr>
<tr>
<td>T. Yukawa, N. Tsuda and A.T. Somborger</td>
<td></td>
</tr>
<tr>
<td>Strings with extrinsic curvature: an analysis of the crossover regime</td>
<td>795</td>
</tr>
<tr>
<td>M. Bowick, P. Coddington, L. Han, G. Harris and E. Marinari</td>
<td></td>
</tr>
<tr>
<td>2.18. Induced gauge theories</td>
<td></td>
</tr>
<tr>
<td>Fermion induced SU($N$) Yang–Mills theory</td>
<td>801</td>
</tr>
<tr>
<td>A. Hasenfratz</td>
<td></td>
</tr>
<tr>
<td>A study of the $N = 2$ Kazakov–Migdal model</td>
<td>804</td>
</tr>
<tr>
<td>A. Gocksch</td>
<td></td>
</tr>
<tr>
<td>Kazakov–Migdal induced lattice gauge theory and the coupling of 2d quantum gravity to $d = 1$ matter</td>
<td>808</td>
</tr>
<tr>
<td>M. Caselle, A. D’Adda and S. Panzeri</td>
<td></td>
</tr>
<tr>
<td>2.19. Spin models</td>
<td></td>
</tr>
<tr>
<td>Possible failure of asymptotic freedom in two-dimensional $RP^2$ and $RP^3$ $\sigma$ models</td>
<td>815</td>
</tr>
<tr>
<td>S. Caracciolo, R.G. Edwards, A. Pelissetto and A.D. Sokal</td>
<td></td>
</tr>
<tr>
<td>Scaling and asymptotic scaling in two-dimensional $CP^{N-1}$ models</td>
<td>819</td>
</tr>
<tr>
<td>M. Campostrini, P. Rossi and E. Vicari</td>
<td></td>
</tr>
<tr>
<td>Finite size effects, scaling and algorithms for lattice $CP^{N-1}$</td>
<td>823</td>
</tr>
<tr>
<td>A.C. Irving</td>
<td></td>
</tr>
<tr>
<td>1/$N$ expansion of two-dimensional models in the scaling region</td>
<td>827</td>
</tr>
<tr>
<td>M. Campostrini and P. Rossi</td>
<td></td>
</tr>
<tr>
<td>Topological susceptibility and string tension in $CP^{N-1}$ models</td>
<td>830</td>
</tr>
<tr>
<td>M. Campostrini, P. Rossi and E. Vicari</td>
<td></td>
</tr>
<tr>
<td>Dimensional crossover in the XY model</td>
<td>834</td>
</tr>
<tr>
<td>W. Janke and K. Nather</td>
<td></td>
</tr>
<tr>
<td>Critical behaviour of the 3D XY-model: a Monte Carlo study</td>
<td>838</td>
</tr>
<tr>
<td>A.P. Gottlob, M. Hasenbusch and S. Meyer</td>
<td></td>
</tr>
<tr>
<td>Large scale numerical simulation of three-state Potts model</td>
<td>842</td>
</tr>
<tr>
<td>S. Ohta</td>
<td></td>
</tr>
<tr>
<td>High precision single-cluster Monte Carlo measurement of the critical exponents of the classical 3D Heisenberg model</td>
<td>846</td>
</tr>
<tr>
<td>C. Holm and W. Janke</td>
<td></td>
</tr>
<tr>
<td>2.20. Interfaces</td>
<td></td>
</tr>
<tr>
<td>Direct Monte Carlo measurement of the surface tension in the 3D Ising model</td>
<td>853</td>
</tr>
<tr>
<td>M. Hasenbusch</td>
<td></td>
</tr>
<tr>
<td>Surface tension, surface stiffness, and surface width of the 3-dimensional Ising model on a cubic lattice</td>
<td>857</td>
</tr>
<tr>
<td>M. Hasenbusch and K. Pinn</td>
<td></td>
</tr>
<tr>
<td>Finite-size scaling on the Ising coexistence line</td>
<td>861</td>
</tr>
<tr>
<td>S. Gupta and A. Irbäck</td>
<td></td>
</tr>
</tbody>
</table>
The confined–deconfined interface tension, wetting, and the spectrum of the transfer matrix
B. Grossmann, M.L. Laursen, T. Trappenberg and U.-J. Wiese 865
The interface tension in quenched QCD at the critical temperature
B. Grossmann, M.L. Laursen, T. Trappenberg and U.-J. Wiese 869

2.21. Finite size effects and scattering
Scattering in a simple 2-d lattice model
C.R. Gattringer, I. Hip and C.B. Lang 875
Unstable particles in finite volume: the broken phase of the 4-d O(4) non-linear σ-model
F. Zimmermann, J. Westphalen, M. Göckeler and H.A. Kastrup 879
Meson–meson scattering in lattice QED$_{2+1}$
H.R. Fiebig and R.M. Woloshyn 883

2.22. Miscellaneous
Some universal features of the effective string picture of pure gauge theories
M. Caselle, F. Gliozzi and S. Vinti 889
Gauge invariant extremization
A.J. van der Sijs 893
Monte-Carlo algorithm for non-relativistic many-fermion systems
B.L.G. Bakker, M.I. Polikarpov and A.I. Veselov 897
Kink–antikink dynamics in a realistic heat bath
A. Krasnitz and R. Potting 900
Background fields in three-dimensional lattice gauge theories at zero and finite temperature
H.D. Trottier and R.M. Woloshyn 904
Multicanonical simulations of 2D and 3D Ising spin glasses
T. Celik 908
Weight ratio fixing for abelian gauge theory
T. Lippert, G. Bhanot, K. Schilling and P. Ueberholz 912
Hamiltonian lattice gauge theory: wavefunctions on large lattices
J.B. Bronzan 916
Non-compact gauge fields on the lattice
F. Palumbo 920
Fractal Wilson loop and confinement in non-compact non-Abelian gauge field theory
D. Allouani, H. Kröger and S. Lantagne 924
Analytic variational investigation of euclidean SU(3) gauge theory
N.D. Hari Dass and G. Subramoniam 928
Dimensional versus lattice regularization within Lüscher’s Yang–Mills theory
B. Diekmann, M. Langer and D. Schütte 932
Treatment of many levels in QCD
P.O. Hess and J.C. Lopez 936
On the non-uniqueness of the Schwinger gauge Yang–Mills fields
S. Furui 940
Path integral formalism for a simple interacting nucleon model
E. Mendel 944

List of Participants 949
Author index 963
General Information 967