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Asymptotic methods are of great importance for practical applications, especially in dealing with boundary value problems for small stochastic perturbations. This book deals with nonlinear dynamical systems perturbed

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by noise. It addresses problems in which noise leads to qualitative changes, escape from the attraction domain, or extinction in population dynamics. The most likely exit point and expected escape time are determined

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useful to

researchers and
graduate students.

Brownian diffusion,
the motion of large

molecules in a sea

of very many much

smaller molecules,

is topical because it

is one of the ways in

which biologically

important

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molecules move

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Equation With Applications To Stochastic Problems In Physics that underlies the four simplest models of Brownian diffusion. Soft matter (polymers, colloids, surfactants, liquid crystals) are an important class of

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the language of physics.

This memoir attempts at a systematic study of convergence to stationary state for certain classes of degenerate diffusive equations, taking the general form

$$\frac{\partial f}{\partial t} + L f$$

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=0\$. The question is whether and how one can overcome the degeneracy by exploiting commutators.

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potential.**

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**Such problems
appear under
various guises
in many
diverse
applications in
physics,
chemistry,**

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Equation With
**biology,
electrical
engineering,
etc. However,
they have been
invariably
treated
(following the
original
approach of
Einstein and
Smoluchowski**

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Equation With
) *via the
Fokker-Planck
equation for
the evolution
of the
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function in
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Thus the more
simple direct
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**approach of
Langevin
which we use
and extend
here, has been
virtually
ignored as far
as the
Brownian
motion in a
potential is
concerned. In**

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***addition two
other
considerations
have driven us
to write this
new edition of
The Langevin
Equation.***

***First, more
than five years
have elapsed
since the***

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*publication of
the third
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following
many
suggestions
and comments
of our
colleagues and
other
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readers, it*

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random noise*

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**may be
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using virtually
identical
mathematical
methods.**

**Secondly, in
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have occurred**

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the Langevin
equation to
Brownian
motion.***

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***Consequently,
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all these, a
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*material has
been added so
as to present a
comprehensive
overview of the
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*Asymptotic
Methods for
the Fokker-
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dynamics serve
as mathematical
models for the
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of microscopic
particles of
various shapes
in gaseous,

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The renewed
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molecules is the

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many more.*

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disciplines.
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in periodic

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are studied and
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*textbook form
and will be*

*useful to both
researchers and
students*

*interested in
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of stochastic
processes.*

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***theoretical
foundation and
an
understanding
of atomistic spin-
dynamics (ASD),
and to give
examples of
where the
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text, a
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magnetism in an
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allows for an
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simulations. As
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now at a very
exciting
situation, where
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perform***

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length- and time-
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edge of what is
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possible. In this
way, ASD
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***both validate
and be validated
by state-of-the-
art experiments,
and ASD
simulations also
have the
possibility to act
as a predictive
tool that is able
to explain the
magnetization***

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experimentally
inaccessible
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purpose of this
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relevant
concepts. An
even larger
motivation is to*

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**communicate an
inspiration to
magnetism and
magnetization
dynamics, and
the emerging
technological
fields that one
may foresee,
e.g. in
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***details which
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described in
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such as the
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similarity
solution, the
method of
characteristics,
transformation
of diffusion***

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and relativistic
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***equation and
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distribution is
also discussed.***

***Due to the
growing interest
in the research
on the
generalized
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equations,
several of them***

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are presented.

They are

***described with
some details.***

Recent research

***on the integro-
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equation***

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continuous time
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model shows that the topic has several aspects to be explored. This equation is worked analytically for the linear force and the generic waiting time probability

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**distribution
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**Moreover,
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potential to be
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chemists who
are interested in
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**Keywords:
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needed to
characterise the
rotational,***

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Equation With Applications To translational and conformational dynamics is developed. Then the use of experimental techniques to investigate the dynamics is described; these techniques

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**include NMR
and ESR
spectroscopy,
neutron
scattering,
dielectric
relaxation,
infrared
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and
fluorescence
depolarisation.**

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Some of these experiments are influenced by the collective orientations or director modes which are also considered. The results of these experiments are presented and the theory

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necessary to understand them is described, with particular attention being paid to the influence of the long range liquid-crystalline order on the dynamics.

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describes the role
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calculus and
discusses topics in
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and metallurgy,
such as defect-
diffusion, radiation
damage, and
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decomposition. In addition, he addresses the impact of translational/rotational diffusion on experimental data and covers reaction-diffusion equations in biology. Focusing on diffusion in the quantum domain, the book also

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processes, and
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localization.

This is the first
textbook to include
the matrix

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approach that
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known to be formed by an ever growing range of quite diverse materials, these include those of low molecular weight as well as the novel liquid-crystalline polymers, such phases can also be induced by the addition of a

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solvent to amphiphilic systems leading to lyotropic liquid crystals.

Irrespective of the structure of the constituent molecules these numerous liquid-crystalline phases are characterised by their long range orientational order.

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In addition certain phases exhibit elements of long range positional order. Our understanding, both experimental and theoretical, at the molecular level of the static behaviour of these fascinating and important materials is now

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well advanced. In contrast the influence of the long range order; both orientational and positional, on the molecular dynamics in liquid Cl) Stais is less well understood. In an attempt to address this situation a NATO Advanced Study Institute

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devoted to liquid
crystal dynamics
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processes
occurring in all
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Equation With skills of the participants was impressively wide ranging; they spanned the experimental techniques used in the study of molecular dynamics, the nature of the systems investigated and the theoretical

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models employed to understand the results. While much was learnt it was also recognised that much more needed to be done in order to advance our understanding of molecular dynamics in liquid Cl⁻Stais.

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*with non-equilibrium
processes, the
emphasis is on the
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