Tatsumi	Toshitaka	Anomalous Hall effect in the inhomogeneous chiral phase	Anomalous Hall effect is discussed in the inhomogeneous chiral pase in the presence of the magnetic field. Some topological aspects are figured out, and the close relation to Weyl semimetal is discussed.
Copinger	Patrick Arthur	Chirality Generation in Strong Electromagnetic Fields via the Schwinger Mechanism	The axial Ward identity with mass effects stemming from the Schwinger mechanism is examined in strong parity breaking background electromagnetic fields. Using worldline techniques adopted from an in-in or Schwinger Keldysh formalism, real time out-of-equilibrium expectation values are found. An exponentially suppressed quadratic mass term indicative of the Schwinger mechanism is found for the following out-of-equilibrium observables: chiral density, pseudoscalar condensate, and chiral magnetic effect current. However, in the absence of the Schwinger mechanism, such observables were found to vanish, suggesting a dependence on a vacuum instability for the chiral anomaly. Implications and future directions for a chiral kinetic theory are also discussed.
Sogabe	Noriyuki	Does the chiral magnetic effect change the dynamic universality class in QCD?	Beam-Energy-Scan Program has two important goals: one is the search for the anomaly-induced transport phenomena called the chiral magnetic effect (CME) and the other is the search for the QCD critical point between the hadron and quark-gluon plasma phases. Since dynamic critical phenomena generally depend on low-energy gapless modes, it is a priori nontrivial whether the collective gapless mode called the chiral magnetic wave stemming from the CME affects the dynamic universality class in QCD. To address this question, we study the dynamic critical phenomena near the second-order chiral phase transition in massless two-flavor QCD under an external magnetic field. By applying the dynamic renormalization-group analysis to the Langevin-type low-energy effective theory near the phase-transition temperature, we find that the inclusion of the CME qualitatively changes the dynamic universality class of the system from model E to model A within the Hohenberg and Halperin's classification.
Nishimura	Kentaro	Inhomogeneous η' condensation in rotating baryonic matter	We study properties of baryonic matter under rotation, especially low-density hadron phase and high-density color-flavor locking phase. We find that, under sufficiently fast rotation, the topological term for the eta' meson modifies the ground state of baryonic matter into an inhomogeneous condensate of the eta' meson, called the chiral soliton lattice. We show that its critical angular velocity is proportional to the square root of the strength of the QCD anomaly.
Pu	Shi		
Yang	Lixin	Electric Conductivity from Chiral Kinetic Theory with Landau level basis	We derive a chiral kinetic theory with Landau level basis which is valid for a magnetic field in an arbitrary regime. We apply the new chiral kinetic theory to calculate the electric conductivity transverse to the magnetic field in a magnetized QED and QCD plasma. Under the Lowest Landau level approximation and relaxation time approximation, we find the transverse conductivity approaches a constant and is inversely proportional to the relaxation time. We also obtain a frequency-dependent transverse conductivity as the response to a time-dependent electric field. We find a high frequency enhancement in this conductivity.
Yee	Ho-Ung		
Mameda	Kazuya	Chiral kinetic theory in curved spacetime	The chiral kinetic theory (CKT) is the important tool to kinematically describe the anomalous transport phenomena. Despite of the various efforts, the framework of the CKT has so far been restricted in the flat spacetime. Thus, the present CKT is unadaptable to understand the general relativistic aspects of the anomalous transport phenomena. In this talk, based on quantum field theory, we derive the CKT in general coordinate up to O(hbar^2). The resulting theory involves a new ambiguity related to the spin tensor, which could be understood as another frame choosing vector. As the first application, with the CKT in rotating coordinate, we show that the chiral vortical effect is generated by the Coriolis force or the spin-vorticity coupling, dependently on the choice of the observer’s frame. As the second one, we derive the novel anomalous current proportional to the Ricci tensor, which is induced by fluid velocity and temperature gradient. We also briefly discuss the possible application to the spintronics in the Weyl/Dirac semimetals or the heavy-ion collision experiments.
LIAO	JINFENG	TBC	

Horvath	Miklos	Chiral magnetic response to arbitrary axial imbalance in constant magnetic field	The response of chiral fermions to time and space dependent axial imbalance & constant magnetic field is analyzed. The axialvector-vector-vector three-point function is studied using a real-time approach at finite temperature in the linear response approximation. The chiral magnetic conductivity is given analytically for non-interacting fermions. It is pointed out that local charge conservation plays an important role when the axial imbalance is inhomogeneous. Proper regularization is needed which makes the constant axial imbalance limit delicate: for static chiral charge the CME current vanishes. In the homogeneous (but possible time-dependent) limit of the axial imbalance the CME current is determined solely by the chiral anomaly. As a phenomenological consequence, the observability of the charge asymmetry caused by the CME turns out to be a matter of interplay between various scales of the system. Possible plasma instabilities resulted from the gradient corrections to the CME current are also pointed out. Ref.: arXiv:1911.00933
Huang	Xu-Guang	Chiral and spin kinetic theory in curved spacetime	
Defu	Hou	TBD	
Gao	Jian-Hua		
Ryblewski	Radoslaw	Relativistic hydrodynamics for spin-polarized media	Recent progress in the formulation of relativistic hydrodynamics for particles with spin one-half is reviewed. We start with general arguments advising introduction of a tensor spin chemical potential that plays a role of the Lagrange multiplier coupled to the spin angular momentum. Then, we turn to a discussion of spin-dependent distribution functions that have been recently proposed to construct a hydrodynamic framework including spin and serve as a tool in phenomenological studies of hadron polarization. Distribution functions of this type are subsequently used to construct the equilibrium Wigner functions that are employed in the semi-classical kinetic equation. The semi-classical expansion elucidates several aspects of the hydrodynamic approach, in particular, shows the ways in which different possible versions of hydrodynamics with spin can be connected by pseudo-gauge transformations. These results point out at using the de Groot?van Leeuwen?van Weert versions of the energy?momentum and spin tensors as the most natural and complete physical variables. Finally, a totally new method is proposed to design hydrodynamics with spin, which is based on the classical treatment of spin degrees of freedom. Interestingly, for small values of the spin chemical potential the new scheme brings the results that coincide with those obtained before. The classical approach also helps us to resolve problems connected with the normalization of the spin polarization three-vector. In addition, it clarifies the role of the Pauli-Lubanski vector and the entropy current conservation. We close with several general comments presenting possible future developments of the discussed frameworks. Key reference: W. Florkowski, A. Kumar, R.Ryblewski, Progress in Particle and Nuclear
Guo	Xingyu	Spin hydrodynamics from Wigner function method	Using the near-equilibrium Wigner function with vorticity, we derived hydrodynamic equations with the spin degree of freedom. The exact forms of related transport coefficients are given.
Cao	Gaoqing	(Splitting) magnetic catalysis effect prevents neutral pion superfluidity and vacuum superconductivity in strong magnetic field	In the chiral effective Nambu?Jona-Lasinio (NJL) model with two- and three-flavor quarks, we demonstrate that the naively expected neutral pion (π0) superfluidity (NPSF) and vacuum superconductivity (VSC) in constant magnetic field B = B?z are both disfavored, due to the well-known magnetic catalysis effect (MCE) to chiral symmetry breaking. Based on the simple two-flavor NJL model, we illuminate in the lowest Landau level approximation the similar origins of π0 and ?ρ+1 (ρ+ meson with spin Sz = 1) mass reductions with B and thus of NPSF and VSC tendencies. With the full Landau levels, the two-flavor NJL model is found to be invalid to study the magnetic field effect to ?ρ+1 meson with physical vacuum mass 775 MeV. Then, restricted to ρ meson mass below two-quark threshold in vacuum, that is mρ < 2mq , it is found that π0 mass decreases and then increases with B slowly, and ?ρ+1 mass vanishing point is delayed to larger B compared to the point particle result. In the more realistic three-flavor NJL model, all the quark masses split in strong magnetic field as a combinatorial result of their different current masses and electric charges. By choosing a vacuum mass closer to the physical one, ?ρ+ 1 meson mass is found to be consistent with the LQCD results semi-quantitatively in smaller B region but increase in larger B region. These features are mainly outcomes of the interplay between the Sz − B coupling effect and splitting MCE to the composite u and d quarks, which definitely disfavors VSC when the latter dominates.Furthermore, mesonic flavor mixing is modified by B among the neutral pseudoscalars: π0, η0 and η8, which is very important to suppress the mass enhancement of the effective mass eigenstates at

Wang	Qun	The polarization in a microscopic model	We propose a microscopic description for the polarization from the first principle through the spin-orbit coupling in particle collisions. The model is different from previous ones based on local equilibrium assumptions for the spin degree of freedom. It is based on scatterings of particles as wave packets, an effective method to deal with particle scatterings at specified impact parameters. The polarization is then the consequence of particle collisions in a non-equilibrium state of spins. The spin-vorticity coupling naturally emerges from the spin-orbit one encoded in polarized scattering amplitudes of collisional integrals when one assumes local equilibrium in momentum but not in spin.
KILINCARSLAN	Eda	Relativistic and Nonrelativistic Chiral Kinetic Theories in Rotating Frames	A quantum kinetic equation is modified to take the noninertial features of the rotating frame into account in this study. It is showed that the chiral currents and the energy-momentum tensor calculated by means of the vector and the axial-vector components of the Wigner function are consistent with the hydrodynamical results. A new three dimensional semiclassical chiral kinetic equation is evaluated by using a modified covariant chiral transport equation. Anomalous continuity equation and well known chiral anomalies which are chiral magnetic and chiral vortical effect can be obtained from these transport equations.
Zhuang	Pengfei	chiral kinetic equations in equal-time formalism	We systematically study quantum effect on chiral and UA(1) symmetry breaking under external electromagnetic fields in the frame of equal-time Wigner function formalism.
Igor	Shovkovy	Applications of chiral kinetic theory in Dirac and Weyl semimetals	The use of chiral kinetic theory (CKT) in Dirac and Weyl semimetals will be reviewed. Theoretical subtleties of applying CKT in condensed matter physics and well as the range of its validity will be discussed. Some observable predictions will be mentioned as well.
Lin	Shu	Magneto-vortical coupling in strongly coupled magnetized plasma	We study magneto-vortical coupling in storngly coupled magnetized plasma using holography. When the dual field theory is non-anomalous, a vector charge can be generated by medium effect. When the dual field theory contains chiral anomaly and gravitational anomaly, an additional anomalous contribution to the vector charge can be induced. On the other hand, an axial current is also induced by chiral vortical effect, which is suppressed at large magentic field. However, we do not find the chiral separation effect.
Yoshimasa	Hidaka		
Sheng	Xin-li		
Yang	Di-Lun		