Research Topic for the ParisTech/CSC PhD Program
(one page maximum)

****Field (cf. List of fields below):***
1. Life and Health Science and Technology

Subfield: (Applied Physics, Chemistry, Mathematics, Mech. Eng. etc…)
Veterinary sciences
Title:
Interactions cells/*Anaplasma phagocytophilum*
ParisTech School:
Ecole Nationale vétérinaire d'Alfort (EnvA)
Advisor(s) Name: Nadia Haddad and Henri-Jean Boulouis
Advisor(s) Email:nadia.haddad@vet-alfort.fr /henri-jean.boulouis@vet-alfort.fr

(Lab, website):https://www6.inra.fr/bipar
UMR BIPAR Enva/Anses/Inra

Short description of possible research topics for a PhD: (10-15 lines in English + optional figure)
Anaplasma phagocytophilum is a zoonotic tick-borne bacterium, which also affects ruminants with important economic losses in Europe and in China.*In vivo*, this strict intracellular bacterium is found inneutrophilic granulocytes (NG), but the niche tissues where it can persist and multiply have not yet been identified.We are currently working on the development of a neo-natural model of*in vitro*survival of NG, which will allow tracking the infection bystrains of different origins and answer questions about host specificity. This monitoring requires the ability to locate the bacteria during the infection. The PhD project has two components:
- *In vitro*, the identification of the relationships between the bacteria and the infracellular components involved in the interactions with the bacteria with different omics approaches.Production and characterization of monoclonal antibodies against *A. phagocytophilum* (presently missing) will allow tofollow-up cell infection (NG), using the capabilities of the confocal microscope that we just acquired.
- *in vivo,* thefollow-up of infection in both vertebrate hosts(mouse model) and tick tissues. A prerequisite will be obtaining a strain of *A. phagocytophilum* labeled with green fluorescent protein (GFP).

Required background of the student: (Which should be the main field of study of the applicant before applying)
Cellular biology and technology
A list of 5(max.) representative publications of the group: (Related to the research topic)
1: Gioia GV, Vinueza RL, Marsot M, Devillers E, Cruz M, Petit E, Boulouis HJ, Moutailler S, Monroy F, Coello MA, Gondard M, Bournez L, Haddad N, Zanella G.Bovine anaplasmosis and tick-borne pathogens in cattle of the Galapagos Islands. Transbound Emerg Dis. 2018 Oct;65(5):1262-1271. doi: 10.1111/tbed.12866.
2: Lagrée AC, Rouxel C, Kevin M, Dugat T, Girault G, Durand B, Pfeffer M, Silaghi C, Nieder M, Boulouis HJ, Haddad N. Co-circulation of different *A.phagocytophilum* variants within cattle herds and possible reservoir role forcattle. Parasit Vectors. 2018 Mar 9;11(1):163. doi: 10.1186/s13071-018-2661-7.
3: Dugat T, Haciane D, Durand B, Lagrée AC, Haddad N, Boulouis HJ. Short Report: Identification of a Potential Marker of *Anaplasma phagocytophilum* Associated withCattle Abortion. Transbound Emerg Dis. 2017 Oct;64(5):e1-e3. doi:10.1111/tbed.12508.
4: Dugat T, Zanella G, Véran L, Lesage C, Girault G, Durand B, Lagrée AC,Boulouis HJ, Haddad N. Multiple-locus variable-number tandem repeat analysispotentially reveals the existence of two groups of *Anaplasma phagocytophilum*circulating in cattle in France with different wild reservoirs. Parasit Vectors. 2016 Nov 22;9(1):596.

5: Dugat T, Loux V, Marthey S, Moroldo M, Lagrée AC, Boulouis HJ, Haddad N,Maillard R. Comparative genomics of first available bovine *Anaplasma phagocytophilum* genome obtained with targeted sequence capture. BMC Genomics.2014 Nov 17;15:973. doi: 10.1186/1471-2164-15-973.