Instituto Nacional de Ciência e Tecnologia de Fluidos Complexos (INCT-FCx)

Annual Report – Year 1
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CAPES

Ministério da Ciência e Tecnologia

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FAPESP

Instituto Nacional de Ciência e Tecnologia de Fluidos Complexos

(Partial Report – First Year)

Introduction

This report contains an introductory text with a description of the main research results, a brief discussion of the interactions among research groups and laboratories, and some perspectives of future work. It includes two appendices:

Annex I – scientific publications, invited presentations at scientific meetings, publications for the general public, participation in scientific meetings, students with finished programs of work, current students, patents, prizes, and chapters of books.
Annex II – activities of teaching and of services to the general public, recycling courses, organization of the site of the Institute, organization of schools.

The steering committee

Members

Prof. Dr. Antônio Martins Figueiredo Neto (Coordinator)
Prof. Dr. Luis Juliano Neto (Vice-Coordinator)
Prof. Dr. Francisco Antonio Helfenstein Fonseca
Profa. Dra. Iolanda Midea Cuccovia
Profa. Dra. Lia Queiroz do Amaral
Prof. Dr. Luiz Roberto Evangelista
Prof. Dr. Niels Olsen Saraiva Camara
Prof. Dr. Sylvio Roberto Accioly Canuto

The composition of the steering committee has been enlarged according to a request accepted by CNPq due to the diversity of research areas in the Institute. There were the following meetings of the steering committee:

1) **8th June 2009** at IFUSP. The committee discussed the organization of the *8th Ibero-American Workshop on Complex Fluids and their Applications*, to take place in September 2009, in João Pessoa. This scientific meeting was considered as appropriate to present the research work of the members of the INCT-FCx. The committee discussed the organization of a School on Complex

Fluids in João Pessoa. Also, the committee discussed the progress of the research work at the Institute.

2) **19th August 2009** at IFUSP. The committee discussed the progress of the research work and the planned activities of teaching and extension.
3) **10th September 2009** in João Pessoa. The committee discussed the progress of research work and teaching proposals.
4) **17th December 2009** at IFUSP. The committee discussed the financial situation of the proposal, the organization of the Fourth Summer School of Complex Fluids that was planned to take place at Escola Paulista de Medicina (UNIFESP) in March/April 2010.
5) **5th to 7th March 2010** during the First Meeting of Evaluation of the INCT-FCx that has taken place at Hotel Alpino, in São Roque, São Paulo, on 5 to 7 March 2010. The committee discussed the work in progress.

Main results of the research activities

1) The joint work at ICB-USP, IFUSP, at FO in São José dos Campos (UNESP), and at IMEUS, has been aimed at the investigation of the association between chronic periodontal diseases and indicators of risk of cardiovascular diseases. Besides comparing the optical properties, we have also compared blood lipid profile,, and levels of cytokines, anti-oxLDL antibodies, thiobarbituric acid, reactive substances (TBARS), and the differential hemogram, of patients with and without periodontitis, using forty patients in each group, which were organized according to sex, age, and the index of body mass. The associations between the occurrence of periodontitis and other variables were analyzed independently. We formed enrolled patients in several groups according to of classical risk factors of cardiovascular diseases, according to criteria of such as sex (female, male), age (< 45 years, 45 years or more), and index of body mass (< 25 kg/m^2; 25 kg/m^2 or more – overweight), and we also defined new groups by several combinations of these categories. We have made serological distinctions in the new groups, sometimes involving risk factors for atherosclerosis. We have used non parametric statistical methods for the identification of these differences. Finally, we have used a logistic regression model, taking into account sex, age, and body mass, to analyze whether periodontitis is a risk factor for pathological lipid levels. Results of the analysis support the suggestion of the association between coronariopathieses and periodontal diseases.

2) Synthesis and spectroscopic characterization of Europium-Tetracycline complexes for the quantification of human lipoproteins. The Europium-Tetracycline (EuTc) complex has some interesting optical properties. It presents absorption around 400 nm and emission around 615 nm, which means a large Stokes displacement. The emission of Europium, coming from an antenna effect, is strongly dependent of the characteristics of the solution, such as the pH and the presence or absence of lipoproteins, etc. The life time of fluorescence of Europium ion in the EuTe compound is long, of the order of 20 μs, and distinct form most of the life times of biological environments. We have proposed the synthesis and the optical spectroscopy characterization of the following Europium complexes: Europium-

Tetracycline (EuTc), E uropium-Chlorotetracycline (EuCTc), E uropium-Metacycline (EuMTc) and Europium-Oxitetracycline (EuOTc). W e ha ve also pr oposed t he s tudy of t he i nteraction o f these complexes with LDL and oxidized LDL. We have come to the conclusionded that all of these solutions of Europium Tetracycline (EuTc) present changes in the absorption spectra with respect to the solutions of Tetracyclines, which is an indication of complexation. The shape of the emission band of Europium changes acco rding to th e T etracycline complex. T he EuOTc complex p resents the s trongest s ignal intensity and a larger time of life with respect to the other complexes. The EuMTc complex is not a good candidate f or a biosensor. T he EuMTc complex h as n ot p resented t he ad equate features for t he quantification of the LDL, since there was no enhancement of the intensity of emission with the increase of the concentration of LDL. The study of the Tc complexes in the presence of LDL has shown that the EuOTc complex i n the presence of LDL has a large i ntensity o f emission, but i t s aturates a bove 1 ,.5 mg/mL o f LDL. On the other h and, t he EuCTc (1.5:1) complex has a w eaker i ntensity of emission a s compared to the EuTc complex, although it displays a larger region of linearity in the calibration curve. In the study of the life time of the EuTc and EuCTc complexes in the presence of LDL, we have observed an increase of the life times of fluorescence in the presence of LDL. However, the largest ratio between signals of fluorescence, i n t he pr esence a nd i n t he a bsence of LDL, ha s be en presented by t he EuCTc complex. Therefore, t he current studies i ndicate t hat E uCTc i s the be st complex f or qua ntification. In general, w e h ave s een t hat t he s tudied E uTc c omplexes do not s uffer any i nterference of pr obe i ons. However, i n t he EuCTc:oxLDL complex a ll of t he s tudied ions, w ith t he e xception of t he c opper i on, display an increase of the intensity of the emission signal of the Europium ion. This may be explained by the Fenton equation in the opposite direction, that is, the presence of interferents leads to the production of h ydrogen peroxide, w hich i n t urn l eads t o the e nhancement of t he E uropium s ignal. T his i s a n important result, since it may give rise to a method for the dosage of oxidized LDL in the blood plasma. The addition of substances as Nickel or Aluminum in the EuCTc with the blood plasma may be used as a marker of oxidized LDL.

3) The in teraction o f an a ntimicrobial p eptide (gomesine) w ith giant lipid vesicles (GUV) h as been s tudied b y opt ical microscopy. T he opt ical m icrocopy of G UVs a llows t he vi sualization o f t he effect of the antimicrobial peptides in a single vesicle in real time. We have seen that the presence of the peptide provoked a sudden explosion of the vesicle, due to the rupture of a lipid bylayer, which indicates the ex istence o f a " carpet" m echanism of a ction. W e a re c ontinuing t his w ork i n or der t o c heck t he presence o f th is me chanism in o ther a ntimicrobial peptides. W e al ready s ee t hat s ome p eptides, as magainine a nd p rotegrine, are c apable o f f orming s table p ores (the s o-called "t oroidal p ores"), w hich gives rise to an integral vesicle, but with a highly permeable membrane. In the context of the Institute, we have b egun a c ollaboration t o s tudy another a ntimicrobial pe ptide that ha s be en s ynthesized b y researchers from Embrapa (Drs. M. A. Rodrigues and M. P. Bemquerer). In this work, we are studying the interactions of the Cecropine/Melitine hybrid peptide with liposomes. The effects of the charge of the liposome, of t he r atio peptide/liquid, a nd of t he c oncentration of s alts, a re s tudied w ith d ifferent methodologies. R esults of opt ical m icroscopy o f GUVs already s how t hat t he p eptide d estabilizes t he vesicles (explosion). This explosion occurs after the formation of domains on t he surface of the GUVs,

which may explain the observed "time lag" in the experiments of leakage in the implanted fluorescent tracers.

4) Characterization of the changes of shape of the aggregates of water mixtures of dodecylsulfate of sodium (SDS) with decanol. Initial measurements of EPR (involving Dr. S. Schreier) have already been carried out with two paramagnetic probe ions introduced in 10 w% SDS with different molar fractions of decanol (0, 22 and 42 mol%) and in 30 w % SDS. From the EPR spectra, it is possible to gauge the degree of packing and the polarity of the microenvironment of the probes. According to previous SAXS data, we knew that 10 w% SDS with 0, 22 e 42 mol% decanol formed spherical, cylindrical and discotic micelles, respectively. Also, pure 30 w% SDS forms cylindrical micelles. The EPR results indicate that the spectra of one of the probes are sensitive to the different morphologies of the micelles. As the micelles change from spherical to cylindrical and to discotic shapes, the spectra reflect the progressive decrease of mobility and polarity of the environment. Although the differences are slight, we may conclude that EPR is sensitive to these changes of shape, and that it will be possible to use this technique to study other amphiphilic systems.

5) One of the topics in the proposal of the INCT is the study of domains (called "rafts") formed by ternary mixtures of saturated lipids, unsaturated lipids and a sterol, with emphasis on the effects of the replacement of cholesterol, which is the main sterol that is present in great quantities in the membranes of mammals, by phytosterols that are present in membranes and plants and are associated with some diseases in humans. The clinical effects of excess of phytosterols in the organism are studied by the medical group of Dr. Francisco Fonseca. We have proposed the use of optical microscopy of giant lipid vesicles (GUV) to study the different ways cholesterol and phytosterols are able to form lipid bylayers. This approach allows the direct visualization of macroscopic domains, taking advantage of the preference of some fluorescent probes for one of the phases. Due to the time it takes to import some chemical compounds, it has not yet been possible to begin the study of the separation of phases in the presence of phytosterols. However, we have made advances in the study of separation phases with cholesterol, which we plan to use in the comparison with future data for phytosterols. We have investigated ternary mixtures of DOPG (an anionic phospholipid), SM (saturated phospholipid), and cholesterol, and we have indicated the lipid concentrations at which there is separation of the liquid phases (ordered liquids or rafts, disordered liquids or fluids). It was new in this work the replacement of the commonly used unsaturated lipid (DOPC, neuter) by an analog, but negatively charged. The development of this work, done in part in Germany and in part in Brazil, was very important to gain familiarity with the study of lateral separation of phases in GUVS. The next step consists in the extension of this work to investigate the role of replacing cholesterol by different phytosterols.

6) In the study of phenomena of adsorption of ions in nematic liquid crystals and complex fluids, the main results in this first year refer to the role of these ions in the signal of impedance spectroscopy. The analysis of diffusive phenomena in anisotropic media, with the typical geometry of liquid-crystalline systems, pointed out the occurrence of anomalous diffusion even in situations that can be associated with a standard diffusion equation (and in which we should anticipate obtaining anomalous diffusion from a

fractional diffusion equation). On the other hand, it has been possible to establish an analytic expression for the impedance of a typical cell, taking into account the role of the ions in the sample and describing the diffusive behavior by a fractionary equation. In comparisons with the literature, our most relevant results are the exact solutions of these equations, with the simultaneous consideration of the Poisson equation for the electric potential inside the samples. Old results are approximations that ignore the Maxwell equations inside the material medium. Our procedure leads to a much more complete expression for the space dependence of the electric field inside the cell, which then gives a quite general expression for the impedance of the system. Preliminary fittings with this analytic expression have indicated wide possibilities of describing some physical systems of enormous interest in the context of the Institute, as liquid crystals, gels, and fluids of biological interest. We are obtaining promising results for complex fluids, in particular lyotropic nematic phases, via nonlinear optical methods.

7) We have made *in vitro* studies of the insertion of nanoparticles of iron oxide in mesenchymal stem cells to be used in therapeutic processes. We have been able to synthesize and characterize biocompatible ferrofluids with several iron oxide coverings, and we have carried out tests of toxicological evaluation and biocompatibility of these nanoparticles. We have made *in vitro* studies of magnetic properties of these nanoparticles by Magnetic Resonance (relaxometry), which can be used in investigations of magnetic images. We have begun the implementation of a technique of magneto-hyperthermia (*in vivo* and *in vitro* studies at Albert Einstein Hospital in São Paulo). We have begun the synthesis of magnetic nanoparticles that are used in magneto-hyperthermia and are then required to display small polydispersion. We have begun the synthesis and characterization of thermosensitive magnetoliposome composites. We have also begun the study of therapeutic effects of human mesenchymal stem cells from the walls of the umbilical chord with the insertion of iron oxide nanoparticles in the animal model of focal brain ischemia. We have been able to carry out the immunophenotypical and ultra-structural characterization of tumor cells of multiform glioblastome. We are now carrying out the synthesis of nanoencapsulated and radiomarker peptides as markers of amyloidal plaques, with relevance for studies of the Alzheimer disease. We have developed research with mesenchymal stem cells marked with *Quantum Dots*. We developed a method for insulating the exosomes from biological solutions with the use of iron oxide nanoparticles. These results and the method of investigation were registered in INPE - Nro P.I. 0900815-2 (d.p. 21/07/2009).

8) Cationic gemini-simile amphiphiles as protease inhibitors. Some cationic representatives of this class of compounds were originally designed for complexation with polynucleotides and transfer through the cell membrane with the purposes of cell transfection, genetic therapy, and *RNAi* inhibition. The protease of the virus of Dengue belonging to the Flaviviridae family prefers substrates that contain cationic peptide sequences. It is peculiar to note that some cationic-amphiphilic gemini-simile peptides were able to inhibit the protease of Dengue. The state of aggregation of the amphiphilic peptides is relevant for the inhibition, since it will be reduced with the addition of a neuter detergent (as Triton). In the usual protocols for the standard selection of inhibitors, an amphiphile inhibitor would have been eliminated, since it would have been considered as promiscuous, as acting to remove the enzyme from the aggregate. In the case of cationic-amphiphilic gemini-simile peptides, it is possible that all

hydrophilic and charged parts of the aggregate will be on the surface, so that the system is accessible to the enzyme, which makes these amphiphiles so effective. Twin surfactants are surfactants with two heads and two tails, which are connected by a spacer with characteristically low critical micellar concentrations (factor of 10^2) and large surface of activity (factor of 10^3) as compared to analogous surfactants of a single chain. The amphiphilic (=surfactant) – peptide 1 has been called "gemini-simile" due to the presence of the two alcohol tails and of the peptide spacer; although asymmetric, there are two charged residues in the space of the peptide. In infection diseases related to the virus of the *Flaviviridae* family (Dengue, West Nile, Hepatitis C), the viral protein has to be broken into structural and nonstructural proteins by the action of the host protease and of the virus. The protease of the host, furine, is a processing protease, with physiological roles, as the conversion of prohormones into active hormones. Although it is desirable to have efficient inhibitors for these proteases, with antiviral effects, it is not trivial to design specific inhibitors. Studies with FRET substrates, in which the fluorescent N-terminal group is Abz (ortho-amino benzoic acid), whose fluorescence is turned off by the EDDnp (ethylenediamine-dinitrofluorfenil) group, have been carried out for furine and the protease of dengue. Furine prefers substrates with the general structure $-\mathbf{R}^{P4}-X^{P3}-(\mathbf{K}/\mathbf{R})^{P2}-\mathbf{R}^{P1}\downarrow X^{P1'}-X^{P2'}-X^{P3'}-X^{P4'}$, while the best substrate for the protease of dengue has the structure Abz-AKRR↓SQ-EDDnp. This means that the ideal substrates for furine and protease of dengue are supposed to have cationic residues in the positions P1-P2-P4 e P1 -P2-P3, respectively, near the cleavage point (↓) in the direction of the N-terminal. It is peculiar that some cationic amphiphile peptides have inhibited the protease of dengue; for palmitoil-Lys-Ala-Lys-hexadecil (C16-KAK-C16) the inhibition of protease of dengue was given by Ki=0.37 μM and the furine by Ki = 5.76 μM. In Table 1, we show the values of Ki for the protease of dengue. We then make a working hypothesis, according to which the protease of the virus NSB2-NS3 of dengue is formed by two parts, and NSB2 is the activator component necessary for the activation of the NS3 dominium. The pI of the activator dominium is 3.6 due to the large number of amino acids, E and D. On the other hand, dominium NS3 has pI = 8.9 due to the large number of basic residues. Therefore, the interaction of NSb2 with NS2 will probably have a strong electrostatic component, and the gemini-simile amphiphilic peptides may compete with this interaction and inhibit the peptidasic activity of NSB2-NS3. Moreover, NSB2 also contains hydrophobic aminoacids, which may as well contribute to the interaction with the dominium NS3, so that the alcohol radicals of the gemini-simile amphiphile peptides may perturb the hydrophobic component of the interaction. We have several lines of work: i) the development in our laboratories of the conditions for the synthesis of gemini-simile amphiphile peptides. In this direction, we are collaborating with Dr. Martin C Feiters, from the department of organic chemistry at the Radboud University of Nijmegen, in Holland. In September 2009, Prof. L. J. Neto stayed during four days in the laboratories of Dr. Feiters, and we have been able to learn all of the details of the synthesis; also, he brought to São Paulo some samples of peptides and of the resins for the synthesis; ii) The obtained gemini-simile amphiphile peptides will be tested as inhibitors of the protease of dengue, as well as of other cationic serino proteases in order to check the specificicity. In these studies we will also include human furine.

Table 1: Ki for the inhibition of the protease of the dengue virus NSB2-NS3 by gemini-simile amphiphile peptides.

C_{16}----- C_{16}	Ki (µM)
-KK-	5.37
-KGGK-	5.75
-KGGGK-	2.50
-KGGGGK-	1.37
-KAK-	0.37
-KAAK-	0.63
-KAAAK-	1.41
-KAAAAK-	2.40

9) Study of the role of oxidized LDL in the progression in humans and murine model of renal diseases in humans and model muridae: relevance of the epithelial-mesenchymal transition. In this stage of the proposal, we have tried to investigated the role of oxidized LDL in the induction of TEM. We have used immortalized HK-2 tubule cells. These cells have been treated bystarved of fetal bovine serum during for 24 hours, and then inoculated incubated with native and oxidized LDL during a period of 48 hours. At the end of this process, we have extracted and quantified the total RNA, and then carried out an analysis of the genetic transcripts by real time PCR in real time. After a statistical analysis, we have seen that the pro-inflammatory molecule, IL-6, presented meaningful data ($p < 0,05$) in the expression of its RNAm. Both forms of LDL induced larger expressions than the control, with a trend of oxidized LDL stimulating a larger expression than the native LDL (Figure 1, panel A), namely. oxLDL induced a significant increase in mRNA of IL-6 ($p<0.05$). In order to evaluate the phenomenon of apoptosis-induced cellular death provoked by oxLDL, apoptosis involved in the process of transformation of the those tubular cells, which are activated by LDL, we have measured the expression the ratio Bcl2/Bax mRNAof RNAm in the ratio Bcl2/Bax. From the statistical point of view, the ratio Bcl2/Bax was larger higher in the treatment with oxidized LDL-treated group with respect to the native LDL, and both were smaller than the control (Figure 1B). In the analysis of the markers of TEM, the expressions of FSP-1 and α-SMA did not present any statistically accepted differences among control, native, and oxidized LDL, but it is possible to detect a trend towards the increase with incubation of lipoproteins with incubation (Figures 1C and D).

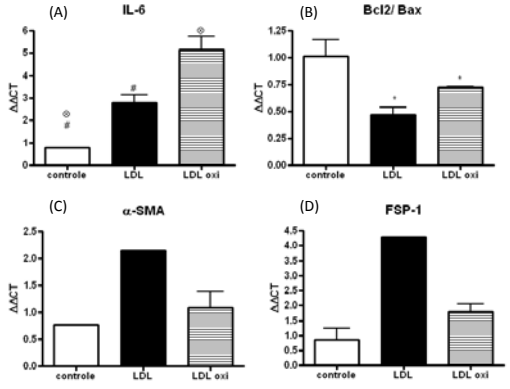

Figura 1: Expression of RNAm from IL-6, Bcl2/Bax, a-SMA and FSP-1 in the tubular cells after 48 hours of incubation with LDL and oxidized oxidada (LDLoxi).

Clinical study: The clinical study is supposed to include 40 patients in each stage of DRC (I-V). We plan to carry out dosages of oxLDL (ELISA), anti-oxLDL (ELISA) and PCR (ultra-sensitive immunoturbidimetry). We plan to use as inclusion criteria the carriers patients withof DRC in with a conservative treatment with ages larger superior to than 118 years. As criteria of exclusion, we will not enroll use diabetesic patients, severely sick patients or patients with inflammatory symptoms, diabetics of type 1, patients with auto-immune diseases, and users of statines or pregnant women. The several groups will be described according to demographic variables using averages and standard deviations for quantitative variables, and frequencies and percentages for qualitative variables. For quantitative variables, the comparisons of groups will be gauged performed by using parametric tests as andthe test ANOVA, or by nonparametric tests as corrected by the test of Kruskal-Wallis, depending on the distribution of obtained data. We have already included 17 patients, and the preliminary results of the demographic features are shown in the following table.

Variable	Values (N=17)
Age (years)	60±17
% de dislipidemia	64,7
% with diabetes	17,6
Estimated clearance of creatinine (ml/min)	31±13
Hb	13±2
Cholesterol	
Total	183±37
LDL	105±27
HDL	48±12
Triglycerides	148±64
Gyicemia (fast)	106±27
PTH intact	130±63

10) We have reached a meaningful advance in the understanding of several systems involving the formation of patterns and adhesive properties of magnetic complex fluids. With respect to phenomena of adhesion in magnetic fluids, we pointed out the non-Newtonian character of chain-forming ferrofluids and explained the mechanisms associated with rheological properties of these fluids. Also, we have shown that magneto-rheological fluids work as efficient "intelligent adhesives" that are able to dramatically enhance their potential of adhesion (from 30 to 50 times) by the application of an external magnetic field. Our theoretical and experimental studies have also been directed to other features of pattern formation and development of hydrodynamic instabilities in magnetic and non-magnetic complex fluids, both miscible an immiscible. The main results in this to pic refer to the implementation and development of several protocols and mechanisms of control of the flow of these materials.

11) We have studied the interactions between colloidal particles adsorbed in the surface of freely suspended films of smectic liquid crystals. We have analytically determined the dependence of the effective force between particles mediated by the elastic deformations of the films. We have investigated the features of the transition by reduction of the layers that is induced by an external field in freely suspended smectic films with negative dielectric anisotropy. We have studied the effects of the immersion of ferroelectric nanoparticles in nematic liquid crystals, and the influence of these particles in the orientational order of these systems. We have studied the reflection spectrum of multilayers involving cholesteric liquid crystals an we have evaluated the potential for making films with a reflection spectrum

in the range of visible light. We studied magnetic and optical properties in solutions of organic molecules. We have shown that hybrid methods of molecular mechanics and *ab-initio* calculations are able to reach good agreement with experimental data. We used dymamic molecular methods to study the effects of addition of the ferroelectric nanoparticles on the properties of nematic liquid crystals. This work has shown that the electric field produced by the dipoles of the ferroelectric particles cannot be the main reason for the increase of the temperature of phase transition, as it has been reported in the literature. We have investigated the properties of a gas of bosons on an Apollonian lattice, which is free of size scales. Using a tight-binding model for non-interacting bosons, we have noted that a certain topology of the lattice induces a Bose-Einstein condensation, so that the transition temperature and the gap between the fundamental and the first excited states behave according to the same power law. Also, we noted that the specific heat is discontinuous at the transition due to the fragmentation of the density of states. We have investigated the transmission optical properties of a multilayer structure formed by an alternate sequence of layers of cholesteric and anisotropic liquid crystals. Using the formalism of the 4 x 4 matrices of Berreman, we have numerically obtained the transmission spectrum of this structure as well as the chromaticity (CIE 1931). Our results show that as the thickness of the anisotropic layers increase the reflection bands are displaced towards regions of larger wave length and there is the appearance of new reflection bands. This behavior results in a drastic change of chromaticity of the structure, which may present a set of new reflection bands in the blue, green and red regions (RGB). We have studied a tight-binding model for a gas of non-interacting fermions on an Apollonian lattice. Due to the topology of the lattice, we have observed an energy spectrum with a fragmented structure that determines the thermodynamic properties of this system. A clear example of this behavior is the specific heat with logarithmic modulations as a function of temperature. This behavior is directly associated with the multifractal character of the Apollonian lattice.

Activities of cooperation between groups of the INCT

We have several mechanisms of interaction:

1) The first mechanism of interaction is the site (http://fluidos.usp.br) of the INCT-FCx. In this site there is a description of the members, of the available experimental facilities, and a forum of discussions.
2) We have organized an annual School for students associated with the groups of the Institute, and an open scientific meeting with international participants.
3) We organized regular seminars at USP for discussing ongoing research topics.
4) The steering committee had regular meeting to evaluate the work in progress and to provide suggestions and eventual corrections of the proposed directions.

Some perspectives and future developments

1) From the theoretical point of view, we plan to pursue a more systematic study of statistical models for mixtures of fluids of several components. Also, we plan to continue the treatment of problems involving the micellization in structured systems as water. In particular, we plan to study the correlation time of water molecules in the interior and near the surface of the micelles.
2) We plan to continue a research involving non-linear optical measurements of human and animal lipoproteins with the purpose of understanding the underlying physical mechanisms.
3) We plan to study the evolution of periodontitis and the risk markers for cardiovascular diseases as a function of time. We will collect information of patients after 3, 6, and 12 months of treatment. This study will be carried out in collaboration with physicists, immunologists, medical dentists, biologists, and mathematicians.
4) We plan intend to continue the research about "Amphiphilic aggregates – studies by fluorescence" , according to subproposal A.5, "Proteolysis and the influence of the lipid medium in organized models", along the man line of research "Lipid bylayers as a model for biomembranes".
5) Theoretical studies of the complexes EuTcs in the presence of LDL. Study of EuTcs in the presence of giant vesicles. Study of the quantification of LDL in model animal blood. Study of EuTcs with oxidized LDL in the presence of metallic ions.
6) We plan the implementation of the technique of magneto-hyperthermia, for in vitro and in vivo studies. We plan to use magnetic nanoparticles in hyperthermia (synthesis and characterization of thermal sensitive magnetoliposome composites). We plan to study the therapeutical effects of human mesenchymal stem cells from the umbilical chord by marking with iron oxide nanoparticles in the animal model of focal brain ischemia. We plan to carry out the immunophenotypical and ultra-structural characterization of tumor cells of multiform glioblastome; the synthesis of radiomarkers and encapsulated peptides to be used as markers of amyloid plaques; to investigate the relevance of these methods for the study of Alzheimer disease; to evaluate the technique of magneto hyperthermia in the treatment of animal models and of tumors removed from patients.
7) We plan to organize new sessions of the recycling course on complex fluids for teachers of public high schools in the regions of Maringá, Ponta Grossa and Campos Gerais, in the state of Paraná.
8) Pharmacotechnical Pharmacotecnical development of lipid emulsions to transport drugs for the treatment of Leishmaniosis. Development of techniques to the quality control of the formulation using physico-chemical tests to quantify the hydrolysis, the in vitro digestion, oxidation and coalescence of particles; and the evaluation of cytotoxic activity in the formulation of infected microphage containing amastigotas of Leishmania.
9) We plan to strength the collaborations between the INCT and the Institute of Biological Sciences at UFMG. This work is already giving rise to a new collaboration among members of INCT, since the group of optical tweezers at UFRJ is interested in the possibility of using mechanical techniques as the optical tweezers to measure elastic properties of membranes in terms of

concentration of cholesterol, which will contribute to improve the work that has been done at the Department of Physics of UFMG.

10) Confined water in hydrophilic and hydrophobic systems. We plan to use a computational model to study the behavior of water in hydrophilic and hydrophobic systems. This investigation will be interesting to understand the mechanisms involving cholesterol. Also, we plan to increase the size of the model molecules of density anomalies. At the moment, we just have a dimer. Our main goal is to design a polymer, a star block copolymer. With respect to the behavior of DNA in solution, we plan to develop an analytic model to understand the association of DNA, sodium chloride, and cyclodextrin, in order to use cyclodextrin in gene therapy by inserting DNA inside the cell membrane. The analytic treatment will be compared with experimental results obtained by the group of Professor Oscar Nassif. In the topic of study of water in cellulose with ethanol, we plan to investigate the mechanisms of extraction of ethanol of cellulose nets by using water at temperatures compatible with the diffusion anomaly. The main goal is to enhance the efficiency of extraction, which will be relevant for the second generation of ethanol implementation. This is an investigation by molecular dynamics. The experiments will be carried out by Dr. Carlos Eduardo Driemeier, at the National Laboratory of Bioethanol (CTBE), which is a research center devoted to the development of the second generation of ethanol. One of the main goals is the possibility of gaining a better comprehension of the behavior of surface tensions in electrolytes and their ability to precipitate and denaturate several proteins, known as Hofmeister effect. In particular, there is a need to understand the mechanisms of ionic hydration. This investigation will be carried out in collaboration with the group of Professor C. J. Mundy, at Pacific Northwest National Laboratory, in the USA, using ab initio simulations of molecular dynamics and quantum chemistry. Another goal is to understand the surface potential and surface tension of acid compounds. A different line of research refers to the properties of confined plasmas and to the dynamics to reach equilibrium. These systems are important to the design of free electron lasers and magnetrons.

(INCT-FCx) Annex I

Scientific publications

1. Alexandre CS, Volpini RA, Shimizu MH, Sanches TR, Semedo P, Di Jura VL, Camara NOS, Seguro AC, Andrade L. Lineage-negative bone marrow cells protect against chronic renal failure. Stem Cells. 2009 Mar;27(3):682-92.
2. Alves S, Alcantara MR, Figueiredo AM Neto. The effect of hydrophobic and hydrophilic fumed silica on the rheology of magnetorheological suspensions. Journal of Rheology (New York), v. 53, p. 651-662, 2009.
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Invited talks at scientific meetings

1. Workshop Nacional sobre Biossensores.Workshop Nacional sobre Biossensores. 2009. (Oficina). Título: Biossensores Fluorescentes. L.C. Courrol.
2. Commemorative Conference 20th Anniversary of the ICCMP, Centro Internacional de Física da Matéria Condensada, ICCMP, Universidade de Brasília, 31 de agosto a 4 de setembro de 2009, palestra plenária convidada, Statistical models of mixtures with a biaxial nematic phase. S.R. Salinas.
3. XXVII Encontro de Físicos do Norte e Nordeste, EFNNE, Belém, Pará, de 9 a 13 de novembro de 2009, palestra convidada, Modelos estatísticos para transições de fases em líquidos anisotrópicos. S.R. Salinas.
4. Evangelista, L. R., Anomalous diffusion, fractional equation, and the adsorption-desorption process of suspended particles in liquid crystals. 8th Ibero American Workshop on complex fluids and their applications – João Pessoa – PB – 8 a 11 de setembro de 2009.
5. Oscar Nassif de Mesquita convidado nas reuniões: Breaking Barriers: From Physics to Biology (palestrista convidado). “Breaking Barriers in our Laboratory at Federal University of Minas Gerais”. Bangalore, India, 2009. (Conferência); First Summer School on Optics and Photonics (invited lecturer); Three lectures on “Optical tweezers and defocusing microscopy”. Concepcion, Chile 2010. (Escola); 8th Ibero-American Workshop on Complex Fluids and their Application (palestrista convidado).”Tomography of Fluctuations in Red Blood Cells”. João Pessoa, 2009 (oficina); Commemorative Conference 20th Anniversary of the ICCMP (palestrista convidado).”Tomography of Fluctuating Biological Interfaces”. Brasília, 2009. (Encontro).
6. XII Escola de Verão Jorge André Swieca de Ótica Quântica e Ótica Não Linear. “Interações dispersivas com superfícies nano-estruturadas”. Fevereiro de 2010. Palestrante: Paulo Américo Maia Neto.
7. Terceira Escola de Nanociências e Nanotecnologia da UFRJ. “Pinças Óticas”. Março de 2009. Palestrante: Nathan Bessa Viana.
8. The 3rd I2CAM/FAPERJ School on condensed soft matter physics. “Soft Matter: From Liquid Crystals to Cells”. Maio de 2009. Palestrante: Nathan Bessa Viana.
9. Symposium: An Agenda of the Future for Biomedical Sciences, ICB/UFRJ, “Physics and Cell Biology”, 07/08/2009. Palestrante: H. Moysés Nussenzveig.
10. Conferência Brasil/França, Academia Brasileira de Ciências, “Cell Membrane Nanotubes”, 14/09/2009. Palestrante: H. Moysés Nussenzveig.
11. Quantum Nonstationary Systems, CIFMC, Brasília “Tunneling”, 20/10/2009. Palestrante: H. Moysés Nussenzveig.
12. Workshop on Nanomagnetism, Spin Electronics and Quantum Optics, CBPF, “Optical Tweezers”, 12/11/2009. Palestrante: H. Moysés Nussenzveig.

13. XII Escola de Verão Jorge André Swieca de Ótica Quântica e Ótica Não Linear, UFF, “O Laboratório de Pinças Óticas da COPEA”. 05/02/2010. Palestrante: H. Moysés Nussenzveig.
14. Symposium in Honor of Prof. Sir Michael Berry, México, “Cell Nanotubes”, 03/03/2010. Palestrante: H. Moysés Nussenzveig.
15. Sylvio Canuto apresentou palestras convidadas em: Palestra plenária convidada 8th Ibero-American Workshop on Complex Fluids and their Applications, João Pessoa, Paraiba, 8 a11 de setembro de 2009; Palestra: “Spectroscopy and Reactivity of Molecules in Liquid Environment”; Palestra plenária convidada no Mini-Simpósio Molecular Simulations, Instituto de Química da USP, 20 de maio de 2009. Palestra: “Combined and Sequential QM/MM For Studying Solvent Effects in Molecular Spectroscopy”. Palestra plenária convidada no XXXV QUITEL, Isla de San Andrés, Colômbia, 18 a 22 de setembro de 2009. Palestra: “Solvation Effects in Spectroscopy and Chemical Processes”. Palestra plenária convidada no 8th International Conference on Computational Methods in Science and Engineering, ICCMSE 2010, Rhodes Island, Grécia, 29/09 a 4/10 de 2009. Palestra: “Electronic Spectroscopy and Reactivity of Molecules in Aqueous Environment”. Participação também como Coordenador de Sessão Plenária. Palestra plenária convidada no 2nd International Symposium on Molecular Modelling in Soil Research, Jena (bei Weimar), Altes Schloss Dornburg, Alemanha, 6 a 7 de outubro de 2009. Palestra: “Solvent Effects in Chemical Processes. Water-Assisted Proton Transfer Reaction of Pterin in Water”. Palestra plenária convidada no 18th Conference on Current trends in Computational Chemistry, Jackson, Mississipi, USA, 30-31 de outubro de 2009. Palestra: “Molecular Spectroscopy and Tautomeric Changes in Aqueous Environment”. Palestra plenária no IV Encontro Anual da Rede Theo-Nano, Santo André, SP, 18 a 19 de novembro de 2009. Palestra: “Reatividade Química em Solução”.
16. Palestras na TU Dresden e no IFAM, Alemanha, outubro de 2009: “Formation and Dynamics of Micelles” (W. Figueiredo).
17. Curso sobre Dinâmica de Biomoléculas, na I Escola de Moléculas e Biomoléculas, Experimento, Teoria Estatística e Modelagem (I EMBio) no Instituto de Física da USP de 25 a 31 de janeiro de 2009. (W. Figueiredo).
18. Yan Levin, Introduction to Statistical Mechanics of Charged Systems,3rd I2CAM-FAPERJ, Rio de Janeiro, Brazil, maio 2009.
19. Yan Levin, Amphiphile-DNA complexes: adsorption, deliver and release, Conference: From DNA-Inspired Phyics to Physics-Inspired biology, Trieste, Italia, junho, 2009.
20. Marcia C. Barbosa ``Density Functional Approach for Charged Systems '', 3rd I2CAM/FAPERJ Spring School em Soft Condensed Matter , Rio de Janeiro, RJ, Maio de 2009.
21. Marcia C. Barbosa ``Thermodynamic, Dynamic and Structural Anomalies for Shoulder-like potentials'', 6th International Discussion Meeting on Relaxations in Complex Systems, Roma, Italia, Setembro de 2009.

22. A.M. Figueiredo Neto, Thermodiffusion in a multicomponent lyotropic mixture in the vicinity of the critical micellar concentration, 8th Iberoamerican Workshop on Complex Fluids and their Application, 2009, João Pessoa, Brasil.

Publications for the general public

1. Jardini MAN. Saúde. Impacto da Periodontite sobre as taxas de gordura no sangue, São Paulo/SP - Brasil, p. 28 - 28, 01 nov. 2009.
2. Figueiredo AM Neto. Aterosclerose, Nova Técnica avalia risco e ajuda a prevenir a doença. Ciência Hoje, vol. 45, pg. 3439, 2009.
3. Valduga, CJ. A indústria Farmacêutica – Uma Breve História. Revista de Pesquisa e Inovação Farmacêutica. , v.1, p.40 - 52, 2009. ISSN 2176-9532.

Participation in scientific meetings

1. XI Congresso Latino Americano de Probabilidade e Estatística Matemática.Clustering Analysis of Linguistic Data. 2009.
2. VII Iberoamerican Congress of Biophysics, 2009, Búzios, RJ – Brazil.
3. XXXVIII Annual Meeting of SBBq, Águas de Lindóia, SP.
4. XIV International Conference on Small-Angle Scattering 13th-18th september 2009, Examinations Schools, Oxford, UK.
5. XXth Symposium on Bioelectrochemistry and Bioenergetics, Sibiu, Romênia. VII Iberoamerican Congress of Biophysics, Búzios, RJ.
6. 7th European Biophysics Congress, Gênova, Itália.
7. Meeting on Nanotechnology, Liposomes and Health, Itaparica, BA. Giant vesicles under oxidative stress.
8. 53rd Annual Meeting of the Biophyical Society, Boston, EUA. Giant vesicles under oxidative stress.
9. 13th Topical Meeting on the optics of liquid crystal, Erice(TP) – Italy – September 28 – October 2, 2009.
10. 10th European Conference on Liquid Crystals, Colmar, France, April 19-24, 2009.
11. Gordon Research Conference, Colby-Sawyer-College, New London, NH, USA – Período: 14 – 19/06/2009.
12. 13th Topical Meeting on the optics of liquid crystal, Erice (TP) – Italy – September 28 – October 2, 2009.
13. LATIN DISPLAY 2009 – PUC/SP - November 16th-19th – 2009.
14. 100 Congresso Brasileiro de Polímeros (CBPol) – Foz do Iguaçu – 13 a 17 de outubro 2009;

15. Keystone Symposia – Targeted Cancer Therapies, Whistler, Canada, 2009.
16. XXXI Encontro Nacional de Física da Matéria Condensada. Águas de Lindoia-SP, de 11 a 15 de maio 2009.
17. 5th European Meeting on Vascular Biology and Medicine (EMVBM), 14th-17th Setember 2009. Marseille, France.
18. XXI Reunião anual da FeSBE – Federação de Sociedades de Biologia Experimental, 19 a 22 de Agosto 2009. Águas de Lindóia -SP- Brasil.
19. XVI WORLD CONGRESS OF THE INTERNATIONAL SOCIETY ON TOXINOLOGY, 19 A 22 DE JUNHO DE 2009
20. CONGRESSO BRASILEIRO DE MICROBIOLOGIA, 8 A 12 DE NOVEMBRO DE 2009.
21. XI REUNIÃO CIENTÍFICA ANUAL INSTITUTO BUTANTAN, 2 A 4 DE DEZEMBRO DE 2009.
22. 11th International Conference on Advanced Materials, Rio de Janeiro, Brasil, 20-25 September 2009,.
23. VII Taller regional de física estadística y sus aplicaciones a la materia condensada TREFEMAC09, Santa Rosa, La Pampa, Argentina, l 4-l6 Mayo 2009.
24. IOP Condensed Matter and Materials Physics (CMMP 2009), University of Warwick, Coventry, UK, 15-17 December.
25. KEYSTONE SYMPOSIA, Colorado, 20 a 25 de janeiro de 2009;
26. XV CONGRESO DE LA SLANH, VI CONGRESO IBEROAMERICANO DE NEFROLOGÍA. Cidade do México 15 a 19 de abril de 2009;
27. AMERICAN TRANSPLANT CONGRESS at the John B.Hynes Convention Center in Boston, Massachusetts, May 30−June 3, 2009;
28. XV International Symposium on Atherosclerosis, 2009, Boston.
29. XV International Symposium on Atherosclerosis. , 2009;
30. World Congress of Nephrology, 2009, Milão, Italia;
31. 9th International Conference on New Trends in Immunosuppression & Immunotherapy, 2010, Geneva;
32. 22nd European Congress of Pathology, 2009, Florence, Italia;
33. 50th Annual Meeting of the European Society for Paediatric Research, 2009, Hamburg, Alemanha;
34. XLVII ERA-EDTA Congress - XLVII European Renal Association - European Dialysis and Transplant Association Congress, 2010, Munich, Alemanha;
35. XI Congresso Brasileiro de Transplantes, 2009, Recife, Brasil;
36. XV Congresso Paulista de Nefrologia, 2009, Campos do Jordão, Brasil;
37. XIV Simpósio sobre Transporte de Eletrólitos e Função Renal - Nefrético, 2009, Ribeirão Preto, Brasil;
38. American Association for Cancer Research, 2008 Annual Meeting. Denver, CO, USA, 18-22 de abril de 2009.

39. NANO 2009 - The International Nanotechnology Conference, Jerusalem, Israel, 30-31 de março de 2009.
40. XV International Symposium on Atherosclerosis, 2009, Boston. 14-18 de junho de 2009.
41. XI Latin American Workshop on Nonlinear Phenomena (LAWNP'09) 05-09 Oct. 2009, Búzios-Brazil.
42. Third international symposium on bifurcations and instabilities in fluid dynamics, Agosto-2009, Nottingham, Inglaterra.
43. 62th Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Novembro-2009, Minneapolis.
44. XI Congresso Latino Americano de Probabilidade e Estadística Matemática. Venezuela, 2009.
45. Fourthy Brazilian Conference on Statistical Modelling in Insurance and Finance. Maresias, SP, 2009.
46. 11ª. Escola de Modelos de Regressão. Recife, PE, 2009.
47. Humboldt Kolleg Foundation, São Paulo, SP, 2009 .
48. XI Latin American Workshop on Nonlinear Phenomena (Rio de Janeiro 2009).
49. NanoIsrael 2009, 2009, Jerusalém. NanoIsrael 2009.
50. XXXII Encontro Nacional de Física da Matéria Condensada, 2009, Águas de Lindóia - SP.
51. 8th Ibero-American workshop on Complex Fluids and their Application, 2009, João Pessoa.
52. XXIV Reunião anual da Federação de Sociedades de Biologia Experimental – FeSBE, 2009. Águas de Lindóia – SP.
53. 38th Annual Scientific Meeting of the ISEH-Society for Hematology and Stem Cells, with the Hellenic Society of Hematology, 2009. Athens – Greece.
54. Congresso Brasileiro de Hematologia e Hemoterapia - Hemo 2009. Florianópolis - SC.
55. 51ST ASH Annual Meeting and Exposition, 2009. New Oleans-LA-EUA. 2009.
56. 3rd I2CAM/FAPERJ Spring School em Soft Condensed Matter , Rio de Janeiro, RJ, Maio de 2009.
57. 6th International Discussion Meeting on Relaxations in Complex Systems, Roma, Italia, Setembro de 2009.
58. Latin American Workshop on Nonlinear Phenomena, Buzios, Rio de Janeiro, RJ, Brasil, Outubro de 2009.
59. Décimo Salão de Extensão, Porto Alegre, RS, Setembro, 2009.
60. II Encontro de Física do RS, Pelotas, RS, Março, 2010.
61. Semana Acadêmcia da Universidade Federal de Rio Grande, Setembro de 2009.
62. Women for Science Symposium, Mexico, Abril 2009.
63. APS March Meeting, Portland, Or, USA, Marco, 2010.
64. 3rd I2CAM-FAPERJ, Rio de Janeiro, Brazil, maio 2009.

Students (with complete programs of work)

1. Adriano Rodrigues Sampieri. Propagação de luz em cristais líquidos com defeitos. 2010. Iniciação Científica. (Graduando em Física) - Universidade Federal da Paraíba, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador Fernando Jorge Sampaio Moraes.
2. Jonas Romero Fonseca de Lima. Fase Geométricas Não-Abelianas e átomos frios. 2009. Iniciação Científica. (Graduando em Bacharelado em Física) - Universidade Federal da Paraíba, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador Claudio Benedito Silva Furtado.
3. Liconandersor Oliveira Dantas. Estudo de Geodésicas em Buracos Negros no cenário de Braneworld. 2009. Iniciação Científica. (Graduando em Bacharelado em Física) - Universidade Federal da Paraíba, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador Claudio Benedito Silva Furtado.
4. Alexandre Pereira dos Santos. Um Estudo em Sistemas Fortemente Correlacionados: Modelo de Cela Esférica e Contraíons Multivalentes. Dissertação de Mestrado. 15/04/2009. Orientador Yan Levin
5. Ana Luisa Langanke Pedroso Meireles. Quantificação de células endoteliais circulantes em portadores assintomáticos do Vírus Linfotrópico Humano de Células T do tipo 1 (HTLV1) por citometria de fluxo. 2009. Dissertação de Mestrado em distúrbios do Crescimento, Faculdade de Medicina da USP. Orientadora Juliana Pereira.
6. Andreia Itami da Silva. Estudo em Fluidos Complexos com Enfoque Cosmológico. Fev/2010. Dissertação de Mestrado em Física. Universidade Estadual de Maringá. Orientadora: Hatsumi Mukai e Co-Orientador Paulo Ricardo Garcia Fernandes
7. Bertulio de Lima Bernardo. Ensaios em sistemas fluidos. 2009. Dissertação de Mestrado em Física. Universidade Federal da Paraíba, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador Fernando Jorge Sampaio Moraes.
8. Carlos Eduardo Ferreira Lopes. Sobre efeitos Quânticos no espaço de de Sitter. 2009. Dissertação de Mestrado em Física. Universidade Federal da Paraíba, Coordenação de Aperfeiçoamento de Pessoal de Nível Superior. Co-Orientador Claudio Benedito Silva Furtado.
9. Danilo Degan Luders. Caracterização óptica de uma fase nemática calamítica situada entre fases isotrópicas. Dissertação de Mestrado em Física. Universidade Estadual de Maringá. Março/2010. Orientador. Antonio J. Palangana
10. David Simeão, Mestrado. Universalidades Nemáticas. Bolsa CAPES. Orientador. Manuel Simões Filho.
11. Eduardo Olímpio Ribeiro Dias. Processos de controle em célula de Hele-Shaw radial. Mestrado. Bolsista CNPq. Orientador José Américo de Miranda Neto. 26/02/2010.

12. Ernando Silva Ferreira. Interações entre albumina de soro bovino (BSA) e substratos sintéticos. Doutorado em Física Aplicada a Medicina e Biologia - FFCLRP USP. 19/02/2010. Orientador A. Ito
13. Fernando José Antonio. Estudo de Defeitos Topológicos em Cristais Líquidos do Ponto de Vista Cosmológico. Fev/2009. Dissertação de Mestrado em Física. Universidade Estadual de Maringá, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador Hatsumi Mukai e co-Orientador Paulo Ricardo Garcia Fernandes;
14. Gelearde Pereira de Souza. Transição nemática biaxial - nemátic calamítica: um estudo de parâmetros ópticos. 2009. Dissertação de Mestrado em Física. Universidade Estadual de Maringá, Coordenação de Aperfeiçoamento. Orientador Antonio José Palangana;
15. Germano Heinzelmann. Dinâmica micelar na transição de fases da água. Dissertação de Mestrado apresentada na UFSC em abril de 2009. Orientador W. Figueiredo.
16. Keila Aparecida da Silva. Síntese e caracterização morfológica, óptica e elétrica do compóstio hidrogel/MBBA. Maio/2009. Dissertação de mestrado em Química. Universidade Estadual de Maringá. Orientador Edvani Curti Muniz, co-Orientador Paulo Ricardo Garcia Fernandes.
17. Lívia Siman Gomes. Estudo da interação DNA-ciclodextrina com a técnica de pinçamento óptico com aplicação em terapia gênica. 2009. Dissertação de Mestrado em Física. Universidade Federal de Minas Gerais. Orientador Oscar Nassif de Mesquita.
18. Roberto Rossato. Soluções e Aplicações da Equação de Difusão Fracionária a Problemas de Contorno. 2009. Dissertação de Mestrado em Física. Universidade Estadual de Maringá, Coordenação de Aperfeiçoamento de Pessoal de Nível Superior. Orientador Luiz Roberto Evangelista.
19. Rodolfo Teixeira de Souza. Reorientação molecular, corrente elétrica e energia de ancoramento em nemáticos, 02/06/2009. Dissertação de Mestrado em Física. Universidade Estadual de Maringá. Orientador Luiz Roberto Evangelista.
20. Sérgio Henrique de Albuquerque Lira. Propriedades adesivas de fluidos magnéticos. Bolsista do CNPq. Dissertação de Mestrado. Orientador José Américo de Miranda Neto. 26/02/2010.
21. Ulisses Moreira Silveira Andrade. Microscopia de desfocalização e seus limites de validade: um estudo experimental. 2010. Dissertação de Mestrado em Física. Universidade Federal de Minas Gerais. Orientador Ubirajara Agero. Co-Orientador Oscar Nassif de Mesquita.
22. Aluizio Torres da Silva. Problemas de Contorno envolvendo as equações de difusão normal, fracionária e fracionária não-linear. Dez/2009. Doutorado em Física - Uem/Uel - Universidade Estadual de Maringá. Orientador Luiz Roberto Evangelista.
23. Anibal Livramento da Silva Netto. Dinâmica Quântica em Espaços com Defeitos. 2010. Doutorado em Fisica. Universidade Federal da Paraíba, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador Claudio Benedito Silva Furtado.
24. César Augusto Refosco Yednak. Problemas de Contorno e Efeitos de Superfície em Células Nemáticas: pequenas distorções. 2009. Doutorado em Física. Universidade

Estadual de Maringá, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador Luiz Roberto Evangelista.

25. Giuseppe Glionna. Tomografia de Hemácias. 2009. Doutorado em Física. Universidade Federal de Minas Gerais. Orientador Oscar Nassif de Mesquita.
26. Josiane Cristina Dias. Cálculo de Constantes Elásticas e Efeitos de Reorientação Molecular em Cristais Líquidos Nemáticos. 2009. Doutorado em Física. Universidade Estadual de Maringá, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador Luiz Roberto Evangelista.
27. Kleber Yamaguti, Comportamento Crítico Gaussiano na Fase Nemática, Bolsa CAPES, Orientador, Manuel Simões Filho. Doutorado.
28. Knut Bakke Filho. Fases Geométricas, Quantização de Landau e Computação Quântica Holonomica para Partículas Neutras na Presença de Defeitos Topológicos. 2009. Doutorado em Física. Universidade Federal da Paraíba, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador Claudio Benedito Silva Furtado.
29. Manoel Messias Alvino de Jesus. Caracterização eletro-óptica de uma mistura líquido cristalina, eutética, em diferentes configurações de confinamento. Dez/2009. Doutorado em Física – UEM/Uel – Universidade Estadual de Maringá. Orientador Paulo Ricardo Garcia Fernandes, co-orientadora: Hatsumi Mukai.
30. Marcelo Resende Thielo. Diagrama de Fases e Anomalia na Densidade em Modelo de Gás de Rede Associativo. Doutorado. 23/02/2010. Orientadora Marcia C. B. Barbosa.
31. Marcia Szortyka, Estudo das Propriedades Dinâmicas e Termodinâmicas em Sistemas Tipo Água. Doutorado. 23/03/2010. Orientadora Marcia C. B. Barbosa.
32. Messias de Souza Costa. Investigação da Teoria de Acoplamentos de Compósitos em Campos de Ondas Térmicas. Set/2009. Tese de Doutorado – IFUSP. Orientadora: Suhaila Maluf Shibli.
33. Paula Borges Monteiro. Feixes de Luz Não-Paraxiais com Momento Angular Orbital e Aplicações às Pinças Opticas. 2009. Doutorado em Física. Universidade Federal do Rio de Janeiro, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador Paulo Américo Maia Neto, co-Orientador Nathan Bessa Viana.

Students (with work in progress)

1. Alexsander Ramos Duarte. Estudo da Impedância da solução KCl em baixa frequência. Início: 2007. Iniciação científica (Graduando em Física) - Instituto de Física da Usp, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador A.M. Figueiredo Neto.
2. Bárbara Bianca Gerbelli e Renata Naporano Bicev. Preparação e caracterização de sistemas lamelares hospedeiros de biomoléculas. Iniciação Científica. Bolsa do projeto Ensinar com Pesquisa –USP. Início jan/2008. Orientadora: Elisabeth Andreoli de Oliveira.
3. Daniel A. Christo. Iniciação Científica. Orientador : Rita de Cassia Ruiz

4. Ewandson Luiz Lameu. Estudo das propriedades fototérmicas de fluidos complexos. Iniciação Científica. Bolsa PIBIC-CNPq e INCT-FCx. Início: Agosto de 2009. Orientador, S.L. Gomez.
5. Gabriela Ayoub Zaina. Absorção ótica e fluorescência em estudos sobre interações entre compostos fluorescentes e membranas modelo. Iniciação Científica. Início: agosto de 2009. Bolsa de treinamento técnico da Pró-Reitoria de Pesquisas da USP. Orientador A. Ito.
6. Hélio de Meira Lins Neto. Iniciação Científica. Orientador J.A. de Miranda Neto.
7. Henrique dos Reis Miguel. Hipertermia com colóides magnéticos aplicada à desobstrução de artérias. Início: 2009. Iniciação científica (Graduando em Física) - Instituto de Física da Usp. Orientador Orientador A.M. Figueiredo Neto.
8. Larissa Rodrigues Montaldi. Atividade proteolítica em membranas modelo. Início: 01 de setembro de 2009. Bolsa PIC-CNPq. Iniciação Científica. Orientador A. Ito.
9. Letícia Bonfim. Estudo de peroxidação lipídica de pacientes hipertensos e hipercolesterolemicos. Início: 2009. Iniciação científica (Graduando em Física) - Instituto de Física da Usp, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador A.M. Figueiredo Neto.
10. Lívia M. Correa. Iniciação Científica. Orientador : Rita de Cassia Ruiz
11. Luiz Henrique da Silva. Estudo de lipoproteínas do sangue por meio de técnicas de óptica não-linear. Início: 2008. Iniciação científica (Graduando em Física) - Instituto de Física da Usp, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador A.M. Figueiredo Neto.
12. Maria Aparecida dos Santos. Iniciação Científica. Graduando em Farmácia. Início: 02/2007. Orientadora C.J. Valduga.
13. Ricardo da Fonseca Rocha. Espumas e os novos estados da matéria. Iniciação Científica. Projeto Ensinar com Pesquisa da USP. Escola de Artes, Ciências e Humanidades da USP. Orientador Prof. Dr. Alberto Tufaile. Vigência: 01/03/2010 a 01/02/2010.
14. Rodrigo Maia Cardozo. Análise de Séries Temporais de Ativos Financeiros. Iniciação Científica. Bolsa CNPq. 2009. Orientador W. Figueiredo.
15. Tamires de Araújo Mora. Estudo de peroxidação lipídica de pacientes tabagistas e diabéticos. Início: 2009. Iniciação científica (Graduando em Física) - Instituto de Física da Usp, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador A.M. Figueiredo Neto.
16. Ana Paula Praxedes. Efeitos de reorientação na tensão superficial de cristais líquidos nemáticos dopados com azo-corantes. Mestrado. Orientador Italo M.N. de Oliveira.
17. André Bombardi. A equação de Einstein e as texturas nemáticas. Mestrado. Orientador Manuel Simões Filho.
18. Carla Rosa Teixeira de Godoy. Quantificação de Células Endoteliais Circulantes em Portadores de Leucemia Mielóide Crônica por Citometria de Fluxo. Início: 2008. Dissertação de Mestrado em Ciências Médicas. Faculdade de Medicina da Universidade de São Paulo. Orientadora: Juliana Pereira.

19. Cássio Alves. Propriedades dinâmicas de fases condensadas de DNA. Dissertação de Mestrado. Início maio 2008. Orientadora: Elisabeth Andreoli de Oliveira.
20. Cíntia E. C. da Cunha Teles. Valores de Referência dos Subtipos Linfocitários em Adultos Normais por Citometria de Fluxo. Início: 2008. Dissertação de Mestrado em Ciências Médicas. Faculdade de Medicina da Universidade de São Paulo. Orientadora: Juliana Pereira.
21. Danilo Olivier. Espectroscopia de fluorescência: aplicações em sistemas biomiméticos. Início: março de 20100. Dissertação de Mestrado em Física Aplicada a Medicina e Biologia - FFCLRP USP. Bolsa CAPES. Orientador A. Ito.
22. Gilvan P. Leonardo. Validação de método, farmacocinética e biodistribuição do HB1 em camundongos. Mestrado. 2007. Orientadora: C.J. Valduga.
23. Gisele Rodrigues Gouveia. Detecção da expressão dos genes associados à resistência múltipla à droga, Oct-1 e MDR-1 e do gene bcl-2 em Linfoma Difuso de Grandes Células B. Início: 2008. Dissertação de Mestrado em Ciências Médicas. Faculdade de Medicina da Universidade de São Paulo. Orientadora: Juliana Pereira.
24. Guilherme Bastos dos Santos Travassos. Efeitos de nao-aditividade das interacoes dispersivas. Início: 2010. Dissertação de Mestrado em Física. Universidade Federal do Rio de Janeiro. Orientador Paulo Américo Maia Neto.
25. Ítalo Adelk Silva Souza. Síntese e desenvolvimento de formulação de fenilbutadienos funcionalizados com atividade antitumoral. 2009. Mestrado. Orientadora C.J. Valduga.
26. José Jardes da Gama Bitencourt. Desenvolvimento de formulação via oral contendo os fármacos miltefosine e itraconazol para tratamento da leishmaniose. Ano de início: 2009. Mestrado. orientadora C.J. Valduga.
27. Keyde Cristina M. Melo. Mestrado. Orientador Rita de Cassia Ruiz.
28. Mari Cleia Martins Rodrigues Ferreira. Estudo do gene securina e DNAPloidia em indivíduos potadores de HTLV-I e Leucemia/Linfoma de células T do adulto como marcador de progressão de doença. Início: 2009. Dissertação de Mestrado em Ciências Médicas. Faculdade de Medicina da Universidade de São Paulo. Orientadora Juliana Pereira.
29. Mariana Canale Manzine. Dissertação de Mestrado. Bolsa CNPq. Orientador I. Cuccovia.
30. Marina Berardi. Análogos fluorescentes de agentes anti-parasitários: interações com agregados anfifílicos. Início: agosto de 2008. Dissertação de Mestrado em Física Aplicada a Medicina e Biologia - FFCLRP USP. Bolsa FAPESP. Orientador A. Ito, mestrado.
31. Rafael Rocha da Silva. Espectro de reflexão e propriedades fotônicas em sistemas multicamadas contendo cristais líquidos colestéricos. Mestrado. Orientador Italo M.N. de Oliveira.
32. Ricardo Alexandre Amaral. A simetrias da fase nemáticas e as partículas de spin 2. Mestrado. Orientador Manuel Simões Filho.

33. Thiago Bento dos Santos. Efeitos de campo elétrico sobre as flutuações térmicas em filmes livremente suspensos na fase esmética-A. Mestrado. Orientador Italo M.N. de Oliveira.
34. Vinicius Mariani Lenart. Estudo das propriedades ópticas não lineares de cristais líquidos luminescentes através da técnica de Z-scan. Mestrado. Bolsa Capes e INCT-FCx. 28/04/2010. Orientador S.L. Gomez.
35. Wallance Moreira Panzin. Anisotropia de fluorescência: aplicações em membranas modelo. Início: março de 2010. Dissertação de Mestrado em Física Aplicada a Medicina e Biologia - FFCLRP USP. Bolsa Bolsa CAPES. Orientador A. Ito.
36. Alexandre Pereira dos Santos. Doutorado. Orientador Yan Levin
37. Amarildes Lorenzo Lôpo Dantas. Estudo da Difusividade Térmica de Fluidos Complexos através da Técnica Efeito Miragem. Início: 2004. Doutorado em Física. Universidade de São Paulo. Orientadora Suhaila Maluf Shibli.
38. Andrezza Steudel. Difusão térmica em Cristais líquidos. Doutorado. Bolsa CAPES. Orientador Manuel Simões Filho.
39. Antonio Weizenmann. Magnetismo em Sistemas Nanoestruturados. Doutorado. Orientador W. Figueiredo.
40. Attila L. Rodrigues. Doutorado. Orientadora Tânia Tome.
41. Bruno Pontes. Propriedades elásticas de nanotubos de membranas celulares. Início: 2007. Doutorado em Ciências Morfológicas. Universidade Federal do Rio de Janeiro. Orientador Vivaldo Moura Neto, co-Orientador Nathan Bessa Viana.
42. Cleidilane de Oliveira Sena. Propriedades magneto-ópticas, mecânicas e não-lineares de elastômeros. Início: 2007. Doutorado em Pós-Graduação. Instituto de Física da Usp, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador A.M. Figueiredo Neto.
43. Davi Antunes de Oliveira. Coeficiente de Absorção e Parâmetro de Ordem em Fases Nemáticas Liotrópicas. Doutorado. 2007. Universidade Estadual de Maringá. Orientador. Antonio J. Palangana.
44. David R. de Souza. Doutorado. Orientadora Tânia Tome.
45. Emerson Rodrigo da Silva. Estrutra e dinâmica de biomoléculas confinadas entre membranas. Doutorado. Bolsa CNPQ. Início agosto 2008. Orientadora: Elisabeth Andreoli de Oliveira.
46. Evandro F. da Silva. Doutorado. Orientador Mario J. de Oliveira.
47. Germano Heinzelmann. Agregação Micelar Próximo de uma Transição de Fase da Água. Doutorado. Orientador W. Figueiredo.
48. Greice Kelle Viegas Saraiva. Doutorado. Orientador I. Cuccovia.
49. João Lucas Correa Silva. Estudo da equação de Navier Stokes aplicada à fluidos nemáticos. Doutorado. Bolsa CNPq. Orientador Manuel Simões Filho.
50. Larissa Martins Gonçalves. Doutorado. Bolsa CNPq. Orientador I. Cuccovia, co-orientador Dr. Sandro Marana.

51. Marcelo Ivan Laczkowski. Caracterização do Efeito Magneto-Óptico em Cristais Líquidos Liotrópicos. Doutorado. Início: 2006. Universidade Estadual de Maringá, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador Paulo Ricardo Garcia Fernandes, Co-Orientador Hatsumi Mukai.
52. Perseu Angelo Santoro. Fenômenos Difusivos convencionais e anômalos. Doutorado. Início 2010. Universidade Estadual de Maringá. Orientador Luiz Roberto Evangelista.
53. Priscila Ribeiro dos Santos. Características ópticas não lineares de lipoproteínas humanas. Início: 2009. Doutorado em Pós-Graduação. Instituto de Física da Usp, Conselho Nacional de Desenvolvimento Científico e Tecnológico. Orientador A.M. Figueiredo Neto.
54. Rafael Cobo. A relatividade Geral e as texturas nemáticas. Doutorado. Bolsa CNPq. Orientador Manuel Simões Filho.
55. Rafael de Souza Dutra. Aspectos da teoria das pinças óticas. Início: 2007. Doutorado em Fisica. Universidade Federal do Rio de Janeiro. Orientador Paulo Américo Maia Neto, co-Orientador Nathan Bessa Viana.
56. Roberta Viana Ferreira. Doutorado. Orientador Lionel Fernel Gamarra.
57. Rodolfo Teixeira de Souza. Energia de Superfície e Defeitos em Cristais Líquidos. Doutorado. Início 2009. Universidade Estadual de Maringá. Orientador Luiz Roberto Evangelista.
58. Sérgio Leandro Espíndola Preza. Fármacos e sondas fluorescentes: estudos espectroscópicos e simulações computacionais. Doutorado em Física Aplicada a Medicina e Biologia - FFCLRP USP. Bolsa CAPES. Início: julho de 2009. Orientador A. Ito.
59. Tiago Ribeiro de Oliveira. Doutorado. Orientador Lionel Fernel Gamarra.
60. Vinicius Teibel Santana. A transição Nemática Isotrópica e o Nascimento do Universo, Doutorado. Orientador Manuel Simões Filho.
61. Yareni Ayala. Migração e propriedades elásticas da membrana e do citoesqueleto celulares. Início: 2009. Doutorado em Física. Universidade Federal do Rio de Janeiro. Orientador Nathan Bessa Viana.

Patents

1. Lionel GC, Janiszewski M, Guilhen DD, Pavon LF, Marti LC. Método para isolamento de exossomos a partir de soluções biológicas utilizando manopartículas de óxido de ferro Nro P.I. 0900815-2 (d.p. 21/07/2009).

Prizes

1. Premio al Investigador Joven (ciencias clínicas), XV Congreso de la Sociedad Latinoamericana de Nefrologia e Hipertensión (SLANH) pelo trabalho “Deficiency of

megalin is the morphological substract of proximal tubular dysfunction in renal transplant patients with stable renal function", Mexico, julho de 2009. (Niels O. Saraiva).

2. Prêmio FESBE 2009, Honra ao Mérito pelo trabalho "Papel das células-tronco derivadas do tecido adiposo na insuficiência renal aguda grave", São Paulo, agosto de 2009. (Niels O. Saraiva).
3. 16° Prêmio Cientifica Dr. Odilo Antunes de Siqueira (2º lugar), pelo trabalho: "Indução da heme oxigenase-1 e a reversão da fibrose túbulo-intersticial". Associação Paulista de Medicina. Presidente Prudente, outubro de 2009. (Niels O. Saraiva).
4. 16° Prêmio Cientifica Dr. Odilo Antunes de Siqueira (1º lugar), pelo trabalho: "Immunosuppressive and remodeling properties of mesenchymal stem cells in a model of chronic kidney disease". Associação Paulista de Medicina. Presidente Prudente, outubro de 2009. (Niels O. Saraiva).
5. Prêmio Professor Eric Roger Wroclawski (1º lugar), Albert Einstein - Instituto Israelita de Ensino e Pesquisa, pelo trabalho "Immunosuppressive and remodeling properties of mesenchymal stem cells in a model of chronic kidney disease", São Paulo, novembro de 2009. (Niels O. Saraiva).
6. Prêmio (2º lugar) de Melhor Artigo no Jornal Brasileiro de Transplantes, Associação Brasileira de Transplantes de Órgãos e Tecidos, pelo trabalho "Expressão de moléculas imunorreguladoras em rins não-funcionantes com rejeição aguda ". São Paulo, dezembro de 2009. (Niels O. Saraiva).
7. Prêmio (1º lugar) de Melhor Artigo no Jornal Brasileiro de Transplantes, Associação Brasileira de Transplantes de Órgãos e Tecidos, pelo trabalho "Atividade anti-inflamatória das células-tronco mesenquimais na lesão de isquemia e reperfusão". São Paulo, dezembro de 2009. (Niels O. Saraiva).
8. XXIII Prêmio Pereira Barreto (1º lugar, categoria Medicina Experimental) do XVII Congresso de Iniciação Científica - PIBIC 2009, Universidade Federal de São Paulo. (Niels O. Saraiva).
9. Destaque no XIII Pereira Barreto (categoria Medicina Experimental) do XVII Congresso de Iniciação Científica - PIBIC 2009, Universidade Federal de São Paulo. (Niels O. Saraiva).
10. Prêmio Magaldi da Sociedade Brasileira de Nefrologia pelo trabalho "Immunosuppressive and remodeling properties of mesenchymal stem cells in a model of chronic kidney disease", São Paulo, novembro de 2009. (Niels O. Saraiva).

Chapters of books

1. The intricate role of adiponectins in immune-mediated diseases. Vieira PM, Landgraf RG, Camara NOS. In: WATSON, Ronald Ross (Ed.). Dietary Components and Immune Function. Prevention and Treatment of Disease and Cancer. Human Press, 2010.

2. Avaliação imunológica pré-transplante: o que o nefrologista (geral) precisa saber. Camara NOS, Silva AP. In: KIRSZTAJN, Gianna Mastroianni (Org.). Investigação Laboratorial em Nefrologia, Editora Sarvier, 2009.
3. Aspectos Imunológicos do TX Renal. Camara NOS, Silva AP. Principais In: AJZEN, Horácio & SCHOR, Nestor (Org.). Guia de Medicina: Nefrologia.Editora Manole, 2009 (3a edição).
4. Células-tronco e doenças renais. Semedo P, Silva AP, Camara NOS. In: AJZEN, Horácio & SCHOR, Nestor (Org.). Guia de Medicina: Nefrologia.Editora Manole, 2009 (3a edição).
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(INCT-FCx) Annex II

Teaching and Extension Activities

UpDating Course

Coordinator: Lia Queiroz do Amaral

In the first semester of 2009 it was proposed the repetition of the updating course for teachers, held as a pilot course in 2007, as an activity of the Millennium Institute of Complex Fluids:
"COMPLEX FLUIDS IN MIDDLE SCHOOL: properties and applications in physics, chemistry and biology".

The initial project was presented in parallel to CENP (Coordination of Studies and Pedagogical Norms) from SEESP (Education Secretary of the State of São Paulo) and to CCext (Culture and Extension Commission) from USP (University of São Paulo) in 2006. It was proposed as transfer of knowledge to Society, with an approach aiming to integrate different aspects of the sciences of Nature. It was proposed as "Physics" due to the inexistence of any "multidisciplinary" entrance. It required complex articulation between the bureaucracies of SEE and USP, since no detailed agreement between SEE and USP existed.

A course of 50 hours (5 full days) was proposed, which corresponds to the minimum required by SEE to give points to the teachers, according to the legislation of the state government of São Paulo from 2005. In 2007 the pilot course was given in 5 full days, along the months of March and April, always with theoretical classes in the mornings and demonstrations in the afternoon, by a team of 6 doctors from the Millennium.

It has been the first updating course for teachers in USP to receive previous authorization, and subsequent habilitation, after analysis by SEE, with certificates issued by USP in agreement to the SEE rules, allowing teachers to receive points for progression in their Carrier.

In 2008 the team produced a text based on the content of the course, with chapters on Structure of Matter (L.Q.Amaral), Thermodynamics and Phase Transitions (T. Haddad), Water (L.Q.Amaral), Water Ionization and pH, (P. Boschcov), Aqueous Systems (L.Q.Amaral), Liquid Crystals and Displays (P.R.Fernandes and A.M.Figueiredo Neto),

Biological Fluids (P.Boschcov) and a final chapter on Demonstrations (A.Tufaile). This text was presented in the final report of the Millennium.

The ICNT Project on Complex Fluids proposed the continuity of this course, inclusive with expansion of the Project to other states of Brazil, and revision of the text for publication as a book.

The repetition of the course was in fact proposed to USP e SEE in the first semester of 2009, following the scheme of the previous pilot course, but now the bureaucracies was already better adapted, since the experience from 2007 was followed on other courses offered by IFUSP after our initial one.

This time the course was proposed as one week with 5 days, during the school holly days of July 2009, keeping the previous team. Two doctors from the Millennium team, which do not belong to INCT (T. Haddad e P. Boschcov) remained as collaborators in this course, and a new doctor from INCT joined the team (Adriana Tufaile). It was necessary to present a new specific justification for approval by SEE, in order to adequate the proposal to the new curriculum approved in 2008 by the State of São Paulo.

Some changes occurred in relation to the pilot course from 2007:

1) Reformulation of the content of Thermodynamics

The course did not start with Thermodynamics, as in 2007, but started with “Structure of Matter”. The content of Thermodynamics was given afterwards, but divided in two separated topics, Thermodynamics and Phase Transitions, given by two doctors. The text revision includes substitution of the previous chapter by these two new chapters.

The text revision for publication as a book started in January 2010 and the new chapter on Thermodynamics is ready.

2) Instead of evaluation exams, questionnaires for evaluation of the course itself have been made, aiming reformulations of the course and also to define the subjects more important in middle school. A better contact with the teachers which followed the course was established, aiming the continuity of the Project in the classrooms of middle school.

After the course, the evaluation questionnaires have been analyzed in a work of L.Q.Amaral in collaboration with Dr. Guilherme Marson (from the Institute of Chemistry of USP) and André Luis de Paula dos Santos (teacher of municipal and state middle schools), who followed the pilot course given in 2007. This analysis was completed with interviews in December 2009, with 4 teachers who attended the course of July, and shall generate a work in the Field of teaching education. The analysis made evidenced a concrete interest in the production of material for “Thermodynamics” for Middle School.

In the second semester of 2009, the group of the State University of Maringá demonstrated interest in starting a similar Project, offering a similar course, with local coordinator Dr. Paulo Ricardo Fernandes. A Project was prepared together with Dra. Lia Q. Amaral and has been already submitted to their University and to the local Teaching Directory, with a proposal of the updating course in Maringá in July 2010. A local team (Paulo Ricardo G. Fernandes e Hatsumi Mukai) will be responsible for Demonstrations and part of the Theory, complemented by two doctors from São Paulo (L.Q.Amaral and Claudete Justina Valduga).

Dr. Sergio Leonardo Gomez manifested also interest in bringing the course to the State of Mato Grosso, and the possibilities are being analyzed by the local Teaching Directory.

A Project coordinated by Dra. Lia Q. Amaral was also presented to the Pro-Rector of Culture and Extension of USP: "From contemporary research to the Middle School: a multidisciplinary perspective focusing Complex Fluids". Two grants for under-graduated students have been given for the period August 2009 to July 2010. These students initially gave their opinion on the text of the updating course, helping to obtain the view of students from middle school. Afterwards subjects were defined so that each one works in material for use in the middle school level:

- Liquid Crystal Display for Adamor Luz Eleiel Virgino (from the Institute of Physics)

- Thermodynamics for Gilberto Sussumu Hida (from the Institute of Mathematics)

Site for INCT-FCx

The site for INCT-FCx was made in the address URL – http://fluidos.usp.br.

The site gives information on activities of the INCT, meetings, schools, courses, experimental facilities, team, Mission, Headquarters, Coordinator, among others. It has a Discussion Forum and channels to attend professionals from Firms, Institutions for Teaching and Research, and Educators of different levels. News and scientific production of the INCT are also described in the Portal.

Schools organized during the period

1. During the 8th Ibero-American Workshop on Complex Fluids and their Applications (8th IAWCFA) - 08 to 11 September 2009 in João Pessoa, it was organized a School of Complex Fluids. It had 69 participants: 30 Brazilian doctors

and 8 foreign doctors; 05 under-graduated students and 26 post-graduated students. The participation of students has financed by INCT.

2. IV Summer School INCT of Complex Fluids - 29, 30 and 31 Match and 01 April 2010 at Escola Paulista de Medicina (UNIFESP), São Paulo, with participation of 64 students from all Brazil: 20 under-graduated students and 44 post-graduated students, financed by INCT.