Notices from the ISMS

November 2007

CONTENTS

For the Welfare of the Humankind
Promoting Mathematical Sciences

INTERNATIONAL SOCIETY FOR MATHEMATICAL SCIENCES
Scientiae Mathematicae Japonicae, Notices from the ISMS

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COMMENT FOR A WORK ON THE GENERALIZED FOURIER TRANSFORM

Hideo Yamagata

Abstract. Precise review for the work [3] by A.S.Focas and L.-Y.Sung is given. The authors of [3] extend the Fourier transform by using the first equations of Lax pairs and by the ∂-bar operators. They obtain the inverse of the Radon transform, and study the initial-boundary value problem in the form of the Ehrenpreis-Palamodov representation.

Introduction

In the work [1] by P.D.Lax, published in 1968, the Korteweg-deVries (KdV) equation $u_t + 6uu_x + u_{xxx} = 0$ could be obtained as the consistency condition of the pair (Lax pair) of the linear equations : $-\psi_{xx} + \lambda^2\psi = u\psi,\ \psi_t = A(u)\psi_x + B(u)\psi$. The inverse scattering method (ISM) is the method to reconstruct the potential $u(x)$ from the scattering data $(a(\lambda), b(\lambda))$ in the Jost function solutions $\psi = a\phi + b\bar{\phi}$ for the first stationary Schrödinger equation. That is, $u(x) = -2dK(x,x)/dx$, and $K(x,y)$ is the solution of the Gelfand-Levitan-Marchenko (GLM) integral equation : $K(x,y) + G(x,y) + \int_{(x,\infty)} G(x,z)K(z,y)dz = 0$, (cf. [2]pp.6–7). Here $G(x,y) = (2\pi)^{-1}\int_{(-\infty,\infty)}(a(\lambda)/b(\lambda))e^{i\lambda(x+y)}d\lambda$.

A.S.Fokas and L.-Y.Sung [3] try to extend the Fourier Transform, found in the work "La Théorie Analytique de la Chaleur (1822)" by J.Fourier, from the viewpoint of the ISM. We would like to give a precise long review of the work [3], in the form being accompanied with Definition and Theorem.

Section 1. Outline of the Work [3].

We would like to define the Fourier type transform considering the Work [1]. The first linear equation of the Lax pair is called Schrödinger type equation (STEq), the second linear equation of the lax pair is called evolution equation (EVEq), and the function $\psi(x,t)$ is called scattering function (SCT). The potential $u(x)$ is written by PT abbreviatedly, and the transformed potential $\hat{u}(k)$ by a transform T is written by TPT.

Definition. Suppose that STEq is solvable, and that SCT $\psi(x)$ is expressed by PT $u(x)$. If SCT $\psi(X)$ is also expressed only by TPT$\hat{u}(k)$, transform T is called Fourier type transform (FTT).

Proposition 1. If T is the Fourier type transform, PT $u(x)$ is expressed by TPT $\hat{u}(k)$. The form of T^{-1} can be given.

Proof. Substituting the expression of SCT $\psi(x)$ by TPT $\hat{u}(k)$ in STEq, one obtains the expressin of T^{-1}.

Riemann-Hilbert (RH) problem (cf. [7], Vol.8, pp. 121–123) : Find two functions $\psi^{\pm}(z)$, analytic in $D^{\pm}$, and satisfying the boundary condition $\psi^{+}(t) = G(t)\psi^{-}(t) + g(t)$ on $L = \overline{D^{+}} \cap \overline{D^{-}}$ and $\psi^{-}(\infty) = 0$. Index $\square = (2\pi i)^{-1}\int d(\log_e G(t))$.

Cauchy-Riemann operator $\bar{\partial}$
(cf. [7], Vol.6, p. 386) : $\bar{\partial} f = \sum_{i=1\sim n+1}(\partial f/\partial \bar{z}_i) d\bar{z}_i$ on C^{n+1}.
The solution of the RH problem expressed by the Cauchy integral is effectively used in the study of the Fourier type transform. ∂-bar operator $\partial/\partial\bar{z}$ is used in the study of the Fourier type transform for the PT $u(z_1, z_2)$ on R^2.

(I) Initial value problem with the space dimensions 1 and 2. The authors give an extension of the Fourier transform from the standpoint of the inverse scattering method (ISM). They consider the Cauchy problem for the linear partial differential equation(PDE) with order n, containing a linearized KdV equation as a special case. PDE is

$$\partial_t q + i\omega(-i\partial_x)q = 0, \tag{1}$$

with $q(x,0) = q_0(x), \quad x \in R^1$. They treat the Lax pair

$$\partial_x \mu - ik\mu(x,t,k) = q(x,t), \tag{2,1}$$

$$\partial_t \mu + i\omega(k)\mu = \sum_{j=0 \sim n-1} c_j(k)(-i\partial_x)^j q(x,t). \tag{2,2}$$

The PDE (1) is the compatibility condition of the sysytem (2,1), (2,2). That is, PDE (1) is derived from the equation :

$$ik\partial_t \mu + \partial_t q = -i\omega(k)\partial_x \mu + \partial_x \sum_{j=0\sim n-1} c_j(k)(-i\partial_x)^j q,$$

where $\omega(\zeta) - \omega(k) = -(\zeta - k) \sum_{j=0\sim n-1} c_j(k)\zeta^j$. The spectral (Fourier) analysis is derived from the equation (2,1). That is,

$$\mu^+(x,t,k) = \int_{(-\infty,x]} e^{ik(x-\xi)} q(\xi,t) d\xi \quad \text{for} \quad \mathrm{Im} k > 0,$$

and

$$\mu^-(x,t,k) = -\int_{[x,\infty)} e^{ik(x-\xi)} q(\xi,t) d\xi \quad \text{for} \quad \mathrm{Im} k < 0,$$

with $\lim_{x\to\infty} \mu^- = 0$, are obtained as the solutions of the STEq (2,1). The jump condition : $\mu^+(x,t,k) - \mu^-(x,t,k) = e^{ikx}\hat{q}(k,t), \ k \in R$, defines a scalar Riemann-Hilbert (RH) problem for the function $\mu(t,x,k)$, where μ : sectionally analytic function. Since the index $\square = 0$, the non-homogeneous RH problem has a unique solution

$$\mu(x,t,k) = (2\pi i)^{-1} \int_{(-\infty,\infty)} \{e^{i\zeta x}\hat{q}(\zeta,t)/(\zeta - k)\} d\zeta, \quad k \in C \backslash R,$$

expressed by Cauchy integral. Then the Inverse Fourier transform of $\hat{q}$ is given from the Proposition 1. Since the Cauchy problem for the nonlinear Schrödinger equation (NLS) :

$$iq_t + q_{xx} - 2|q|^2 q = 0 \tag{3}$$

$x \in R^1$ can be solved by the ISM, nonlinearization of the Fourier transform is also possible in a sense. The NLS (3) is the compatibility condition of the Lax pair of the equations for the 2×2 matrix valued function $\psi(x,t,k), \ k \in C$:

$$\partial_x \psi + ik\sigma_3 \psi = Q\psi, \tag{4,1}$$

$$\partial_t \psi + 2ik^2 \sigma_3 \psi = (2kQ - i\partial_x Q\sigma_3 - i|q|^2\sigma_3)\psi, \tag{4,2}$$

where $\sigma_3 = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ and $Q = \begin{pmatrix} 0 & q(x,t) \\ \bar{q}(x,t) & 0 \end{pmatrix}$. Relation $Q\sigma_3 - \sigma_3 Q = \begin{pmatrix} 0 & -2q \\ 2\bar{q} & 0 \end{pmatrix}$ derives the nonlinear term of the NLS (3).

Direct Map for the PDE (1) is $q_0(x) \to \hat{q}_0(k) = Fq_0(x)$, and Inverse Map for the PDE (1) is $e^{-i\omega(k)t}\hat{q}_0(k) \to f(x,t) = F^{-1}e^{i\omega(k)t}\hat{q}_0(k)$.

They give Derect Map for NLS (3) expressed by the linear Volterra equation, and its Inverse Map described by the Matrix Riemann-Hilbert problem. They extend the above argument for PDE (1) and NLS (3) to the problem in the two dimensional space $R^2 = \{x = (x_1, x_2); x_i \in R\}$ by using ∂-bar operator. The equation

$$\partial\mu(x_1, x_2, k)/\partial\bar{x} - ik\mu = q(x_1, x_2), \tag{5}$$

by $\partial/\partial\bar{x} = (1/2)(\partial/\partial x_1 + i\partial/\partial x_2)$, $k = k_1 + ik_2$, $x = x_1 + ix_2$, is used instead of the equation (2,1), and two dimensional spectral (Fourier) analysis is given. Because the solution of the equation (5) is
$\mu(x,k) = (1/\pi)\lim_{\epsilon\to+0} \int\int_{\{x';|x'-x|>\epsilon\}} \{e^{i[k(\bar{x}-\bar{x}') + \bar{k}(x-x')]/2} q(x'_1, x'_2)/(x - x')\} dx'_1 dx'_2$, and
$\partial\mu/\partial\bar{k} = e^{i(k_1x_1 + k_2x_2)}\hat{q}(k_1, k_2)$ holds.

Proposition 2. STEq (2,1) and (5) derive the Fourier Transforms.

They treat the Lax pair :

$$\partial\mu(x,k)/\partial\bar{x} - (ik/4)\mu = Q\bar{\mu}, \tag{6,1}$$

$$\partial\hat{Q}/\partial t = i(k_1^2 - k_2^2)\hat{Q}, \tag{6,2}$$

where μ is 2×2 matrix valued and $Q = \begin{pmatrix} 0 & q_{12}(x_1, x_2) \\ q_{21}(x_1, x_2) & 0 \end{pmatrix}$.
$\hat{Q}(k_1, k_2) = i(2\pi)^{-1} \int\int_{R^2} e^{-i(k_1x_1 + k_2x_2)} Q(x_1, x_2)\overline{\psi_d(x_1, x_2, k_1, k_2)} dx_1 dx_2$. ψ_d is the diagonal part of ψ : $\mu = e^{i(k\bar{x} + \bar{k}x)/4}\psi$, $\lim_{x\to\infty}\psi = I$. They study the Cauchy problem of the Davy-Stewartson-II equations :

$$\partial_t q = i(\partial_{x_2}{}^2 - \partial_{x_1}{}^2)q - 8i\phi q, \tag{7,1}$$

$$(\partial_{x_1}{}^2 + \partial_{x_2}{}^2)\phi = \pm(\partial_{x_2}{}^2 - \partial_{x_1}{}^2)|q|^2, \tag{7,2}$$

where $q_{12} = q = \pm q_{21}$.

(II) Radon and attenuated Radon transforms and ∂-bar operator.

The equation

$$(1/2)(k+(1/k))\partial_{x_1}\mu + (-i/2)(k-(1/k))\partial_{x_2}\mu = f(x_1,x_2), \tag{8}$$

$k \in C$, is used instead of (2,1) or (5). $(k+(1/k))/2 = \cos\theta$ and $-i(k-(1/k))/2 = \sin\theta$ for $k = e^{i\theta}$.

The Radon Transform :

$$f(x_1,x_2) \to F(\tau,\rho,\theta) = f(\tau\cos\theta - \rho\sin\theta, \tau\sin\theta + \rho\cos\theta) \to \hat{f}(\rho,\theta) = \int_{(-\infty,\infty)} F(\tau,\rho,\theta)d\tau.$$

The attenuated X-ray Radon Transform :

$$g(x_1,x_2), f(x_1,x_2), L(x;\theta) \to \hat{g}_f(\rho,\theta) = \int_{(-\infty,\infty)} \exp\Big(-\int_{(\tau,\infty)} F(s,\rho,\theta)ds\Big)\, G(\tau,\rho,\theta)d\tau.$$

They derive the inverse of the Radon transform (by (8), (9)) used in the medical tools CT, MRI, PET, and of the attenuated Radon transform (by (10)) in SPECT(in Brain imaging). Introduction of the complex variable $z = (-i/2)(k-(1/k))x_1 - (1/2)(k+(1/k))x_2$ derives the equation (for the Radon Transform) :

$$\nu(k)\partial\mu/\partial\bar{z} = f, \tag{9}$$

$\nu(k) := (-i/2)(|k|^{-2} - |k|^2)$, $|k| \neq 1$, from (8). $k = k_1 + ik_2$, $z = z_1 + iz_2$. $\mu^{\pm} = \lim_{\epsilon\to 0}\mu(x_1,x_2,(1\mp\epsilon)e^{i\theta}) = \mp P^{\mp}\hat{f}(\rho,\theta) - \int_{(\tau,\infty)} F(s,\rho,\theta)ds$ $(\mu = \partial_{\bar{z}}^{-1}(f/\nu))$, is obtained, where $(P^{\pm}\hat{f})(\rho) = \pm\hat{f}/2 + (2i\pi)^{-1}H\hat{f}$.
Since $\mu^+ - \mu^- = -H\hat{f}(\rho,\theta)/(i\pi)$, and since we find μ in terms of $\hat{f}(\rho,\theta)$, the inverse of Radon transform is obtained. The inverse is expressed by
$f(x_1,x_2) = -(2\pi)^{-2}i(\partial_{x_1} - i\partial_{x_2})\int_{(0,2\pi)} e^{i\theta}[H\hat{f}(x_2\cos\theta - x_1\sin\theta,\theta)]d\theta$.
$H\hat{f}$ is the Hilbert transform :
$H\hat{f}(\rho) = (1/\pi)\lim_{A\to\infty,\epsilon\to 0}\int_{[\epsilon,A]}\{(\hat{f}(\rho+t) - \hat{f}(\rho-t))/t\}dt$.

Theorem. The Radon Transform is a Fourier type transform.
The equation (for the attenuated Radon Transform)

$$\nu(k)\partial\mu/\partial\bar{z} + f(x_1,x_2)\mu = g(x_1,x_2), \tag{10}$$

is used to obtain the inverse transform, which is derived from
$\mu\exp[\partial_{\bar{z}}^{-1}(f/\nu)] = \partial_{\bar{z}^{-1}}((g/\nu)\exp[\partial_{\bar{z}}^{-1}(f/\nu)])$.
That is, $g(x_1,x_2) = -(4\pi)^{-1}(\partial_{x_1} - i\partial_{x_2})\int_{(0,2\pi)} e^{i\theta}J(x_1,x_2,\theta)d\theta$,
where $J = -\exp(\int_{(\tau,\infty)} F(s,\rho,\theta)ds)\{\exp(P^-\hat{f}(\rho,\theta))P^-\exp(-P^-\hat{f}(\rho,\theta))$
$+\exp(-P^+\hat{f}(\rho,\theta))P^+\exp(P^+\hat{f}(\rho,\theta))\}\hat{g}_f(\rho,\theta)$.

(III) Initial-boundary value problem with the space dimension 1.

The initial-boundary value problems for the equations (1) and (3) are studied by using the Ehrenpreis-Palamodov (E-P) representation, and Direct Map and Inverse Map are obtained.

They consider the equation

$$q_t + q_x + q_{xxx} = 0, \tag{11}$$

as a special example, in the domain $0 < x < \infty,\ 0 < t < \infty$. PDE (11) is PDE (1) with $\omega(k) = k - k^3$. $c_0(k) = k^2 - 1,\ c_1(k) = k$, and $c_2(k) = 1$.

(a) Since the coefficient of k^3 is -1, $(N, \bar{n}) = (1, 2)$, the initial condition : $q(x, 0) = q_0(x) \in H^1(R^+)$, and the boundary condition : $q(0, t) = g_0(t) \in H^1(0, T)$. Assume that $q_0(0) = g_0(0)$. Then the unique solution of the PDE (11) is given by the E-P representation :

$$q(x,t) = (2\pi)^{-1} \left(\int_{(-\infty,\infty)} e^{ikx - i\omega(k)t} \hat{q}_0(k) dk + \int_{\partial D^+} e^{ikx - i\omega(k)t} \bar{g}(k) dk \right)$$

where $D^+ = \{k_R + ik_I; \omega(k_R + ik_I) > 0,\ k_I > 0\}$, and

$$\partial D^+ = \{k_R + ik_I; k_I = (3{k_R}^2 - 1)^{1/2} \geq 0 \text{ for } {k_R}^2 \geq 1/3,\ k_I = 0 \text{ for } {k_R}^2 \leq 1/3\}$$

with the direction of k_R.
Here $\hat{q}_0(k) = \int_{(0,\infty)} e^{-ikx} q_0(x) dx$ by x-transform, $\tilde{g}_0(k) = \int_{(0,T)} e^{i\omega(k)t} g_0(t) dt$ $(k \in C)$ by t-transform,

$$\tilde{g}(k) = \{(\nu_1(k) - k)\hat{q}_0(\nu_2(k)) + (k - \nu_2(k))\hat{q}_0(\nu_1(k))\}/(\nu_2(k) - \nu_1(k)) + (1 - 3k^2)\tilde{g}_0(k),$$

and $\nu_i(k); i = 1, 2$ are the two solutions of the equation $-(\omega(\nu) - \omega(k))/(\nu - k) \equiv \nu^2 + \nu k + k^2 - 1 = 0$.

(b) They give the function $\tilde{g}(k) = \sum_{j=0\sim 2} c_j(k)\tilde{g}_j(k),\ \tilde{g}_j(k) := \int_{(0,T)} e^{i\omega(k)t}(-i\partial_x)^j q(0,t) dt$ $(k \in C)$ in the Direct Map. The E-P representation is used in the Inverse Map.
Comparting **(b)** with **(a)**, it is remained to determine the boundary functions $\{(-i\partial_x)^j q(0,t); j = 1, 2\}$ in the Direct Map. The relation between **(a)** and **(b)** are discussed by using the global relation :
$\hat{q}_0(k) + \tilde{g}(k) = e^{i\omega(k)T} \int_{(0,\infty)} e^{-ikx} q(x, T) dx,\ \mathrm{Im} k \geq 0.$

Section 2. Conclusion and Acknowlegement.
The work [3] is written in the form without Definition and Theorem. Then we interpret that effective extension of the Definition of FTT are difficult. According to F.Cajori [6]p.270, Fourier Transform was found in the work "La Théorie Analytique de la Chaleur (1822)" by J.Fourier, which is the source of all modern methods in mathematical physics. J.Fourier also published the improvement on the Newton-Raphson method of approximation as a part of his work "Analyse des equationes determines (1831)". Then their extensions considering ISM seem to be meaningful. We appreciate the work [3] to take out various problems and to inform the tendency of Gelfand school.
On 8.Nov.'05, Editor Prof. T. Ishihara has asked me to write this Review. I would like to thank him for giving me the chance.

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MONDAY, SEPTEMBER 24

Room F： Plenary Session

From	To		
9:00	10:00		Conference opening
10:00	10:30		Coffee Break

CHAIR：Peter HÄNGGI

From	To	Speaker and Co-authors	Title
10:30	11:20	Toshio YANAGIDA	Fluctuation and Operation of Life
11:20	12:10	Ian D.COUZIN	The Evolution and Mechanism of Collective Motion in Animal Groups
12:10	13:00	Kazuyuki AIHARA	Computational Approach to Nonlinear Dynamics of Prostate Cancer and its Application to Hormonal Therapy
13:00	14:00		Lunch Break

CHAIR: Dean ASTUMIAN

From	To		
14:00	14:20	Peter HÄNGGI	Robert Brown and the Pollen Stuff
14:20	15:00	Takeyuki HIDA	The Mathematical Approaches by Norbert Wiener and Paul Levy

Room F：Neural Networks

CHAIR：Shunsuke SATO

From	To	Speaker and Co-authors	Title
15:00	15:30	Roman BORISYUK , Tom COOKE	Stochasticity and Functionality of Neural System
15:30	16:00	Vito DI MAIO	Short Range Synaptic Interaction on Dendritic Tree
16:00	16:30		Coffee Break

CHAIR: Charles E. SMITH

From	To	Speaker and Co-authors	Title
16:30	17:00	André LONGTIN , Jason MIDDLETON Jan , BENDA , Len MALER	Coding and Decoding along the Electrosensory Periphery
17:00	17:30	Giacomo ALETTI , Paola CAUSIN , Giovanni NALDI , Marianna GOZZO , Giorgio R. MERLO , Ambra A. ZAGHETTO , Adam C. PUCHE	A 3D Computational Model of Axon Growth in the Developing Olfactory Pathway
17:30	18:00	Einat FUCHS , Amir AYALI , Eyal HULATA , Ben-Jacob ESHEL	Increasing Structural and Functional Complexity during the Dynamic Development of Neuronal Networks

Room E: Mathematical and Computational Modeling

CHAIR：Marceelo MAGNASCO

From	To	Speaker and Co-authors	Title
15:00	15:30	Peter HÄNGGI , P. Sekhar BERADA Gerhard SCHMID , David REGUERA , Miguel RUBI J.	Entropic Particle Transport: The Fick-Jacobs Approximation
15:30	16:00	Lutz SCHIMANSKY-GEIER	Stochastic Hierarchical Systems
16:00	16:30		Coffee Break
16:30	17:00	Peter TALKNER	Periodically Driven Fokker-Planck Processes with Metastable States
17:00	17:00	Michèle THIEULLEN Khashayar PAKDAMAN	A Probabilistic Approach to a Stochastic Morris-Lecar Model

CHAIR: Philip HOLMES

From	To	Speaker and Co-authors	Title
17:30	18:00	Andreas SCHIERWAGEN	Mathematical and Computational Modeling of Neurons and Neuronal Networks
18:00	18:30	Viktor BENES , Blazena FRCALOVÁ , Petr LÁNSKÝ	Overdispersion in the Place Cell Discharge Revisited
18:30	19:00	Luca PELITI , Stephan SCHIFFELS	Mutation-Selection Balance and Fitness Distribution in Adapting Diploid Population

TUESDAY, SEPTEMBER 25

8:00-15:00：Informal Discussions and Optional Sightseeing

Room F: Plenary Session

CHAIR: Toshio YANAGIDA

From	To	Speaker and Co-authors	Title
15:30	16:00	Masayasu MIMURA	Self-Organized Patterns in Bacterial Colonies
16:00	16:30	Hirokazu HOTANI , Akihiko ISHIJIMA , Kingo TAKIGUCHI , Takehiko INABA	Formation and Maintenance of Tubular Membrane Projections Require Mechanical Force, but their Elongation and Shortening do not Require Additional Force

Room E, 16.30 - 19.00: Poster Session

1	Masako SATO , Yasuhito MUKOUCHI	Learning Decision Trees over Erasing Pattern Languages
2	Claudia ANGELINI , Luisa CUTILLO , Italia DE FEIS , Richard VAN DER WATH , Pietro LIÒ	Regulatory Sequence Annotation using Cross Gene Expression Data
3	Paul CULL	Stability and Instability in One Dimensional Models
4	Charles E. SMITH , Russell ALPIZAR-JARA	Continuous-Time Markov-Recapture Model for Trapping Experiments
5	Antonio DI CRESCENZO , Maria LONGOBARDI	Competing Risks within Shock Models
6	Takayuki ARIGA , Tomotaka KOMORI , So NISHIKAWA , Atsuko H. IWANE , Toshio YANAGIDA	Measurement System for Mechano-Chemical Coupling: Combining Optical Tweezers and Fluorescent Microscopy
7	Tomotaka KOMORI , So NISHIKAWA , Takayuki ARIGA , Atsuko H.IWANE , Toshio YANAGIDA	Simultaneous Observation of Atpase and Displacement by Myosin V
8	Mitsuhiro IWAKI , Atsuko H. IWANE , Toshio YANAGIDA	Strain-Dependent Binding Rate Controls Directionality of Molecular Motor
9	Maria Teresa GIRAUDO , Laura SACERDOTE , Roberta SIROVICH	Information Measures in a Small Network of Spiking Neurons
10	Laura SACERDOTE , Cristina ZUCCA	Confidence Intervals for the Boundary Estimation with the Inverse First Passage Time Method
11	Laura SACERDOTE , Luigia CAPUTO , Giada BUFFA	On Copulae as a Method to Describe the Coupling of Random Phenomena
12	Ondrej POKORA , Petr LÁNSKÝ	Optimal Odor Intensity in Simple Olfactory Neuronal Models
13	Lubomir KOSTAL , Petr LÁNSKÝ , Jean-Pierre ROSPARS	The Adaptation of the Pheromone Receptor Neuron of a Moth to its Natural Stimulus
14	Giuseppina ALBANO , Virginia GIORNO , Amelia G. NOBILE , Luigi M. RICCIARDI	Modeling Refractoriness for Stochastically Driven Single Neuron Activity
15	Amelia G. NOBILE , Enrica PIROZZI , Luigi M. RICCIARDI	Asymptotics and Evaluations of FPT Densities through Varying Boundaries for Gauss-Markov Processes
16	Giuseppina ALBANO , Virginia GIORNO	Towards a bicompartment stochastic model for tumor growth
17	Gergely J. SZŐLLŐSI , Imre DERÉNYI , Tibor VELLAI	The Maintenance of Sex in Bacteria is Ensured by its Potential to Reload Genes
18	Barbara MARTINUCCI	On the Conditional Firing Activity of a State-Dependent Stochastic Neuronal Model
19	Elvira DI NARDO	On the First Passage Time Problem for Linear Processes
20	Roberto MORENO-DÍAZ , Gabriel DE BLASIO , Arminda MORENO-DÍAZ	Cooperative-Competitive Computation in Modeling Retinal Processing
21	Gianfranco CAUTIERO , Anna CORAZZA , Paola FESTA	Expected Reversal Distance Evaluation by Hidden Markov Models
22	Walter BALZANO , Ferdinando CICALESE Maria Rosaria DEL SORBO , Ugo VACCARO	Genomic Sequences Comparison based on Entropy and Mutual Information Measures
23	Maria MARINARO , Silvia SCARPETTA , Masahiko YOSHIOKA	Associative Memory for Spatio-Temporal Patterns based on Spike Timing Dependent Plasticity
24	Aniello BUONOCORE , Enrica PIROZZI Luigia CAPUTO	On Certain Approximations to Firing Rate for a Periodically Driven Neuron Model
25	Guido GIGANTE , Maurizio MATTIA , Paolo DEL GIUDICE	Perceptual Stochastic Integration as a Model for Binocular Rivalry
26	Anna LITVAK-HINENZON , Lewi STONE	Epidemic Waves, Small Worlds and Targeted Vaccination
27	Mahruy SAIDALIEVA	Computer Modelling Regulatory Mechanisms of Organisms Cellular Communities at Anomalies
28	Mohiniso B. HIDIROVA	Mathematical and Computer Modelling Regulatory Mechanisms of Programmed Cell Death (Apoptosis)
29	Bahrom N. HIDIROV	Mathematical Modelling Regulatory Mechanisms of Hierarchical Molecular-Genetic Systems

WEDNESDAY, SEPTEMBER 26

CHAIR: Ian D. COUZIN

From	To	Speaker and Co-authors	Title
9:00	9:50	Vincenzo CAPASSO	On the Stochastic Modelling of Interacting Populations
9:50	10:40	Mike HOLCOMBE	Validation and Discovery from Biological Models
11:40	11:00		Coffee Break
11:00	11:30	Nanako SHIGESADA	Remembering Ei Teramoto

Room F: Models in Medicine and Biology

CHAIR: Piero COLLI FRANZONE

From	To	Speaker and Co-authors	Title
11:30	12:00	Andrea PUGLIESE	Epidemic Models with Within-Host Immune Dynamics
12:00	12:30	Shinji NAKAOKA , Kazuyuki AIHARA , Takahiko SHIMIZU , Yasuhiro TAKEUKI	Mathematical Analysis of Th1/Th2 Balance Equations: The Role of Competition and Cooperation
12:30	13:00	Taishin NOMURA , Masao NAKANISHI , Toshihiro KAWAZU , Yasuyuki SUZUKI , Yoshihisa KURACHI	Towards the in Silico Human as a Worldwide Open Platform for Physiological Databases and Simulations
13:00	14:00		Lunch Break

CHAIR: Andrea PUGLIESE

From	To	Speaker and Co-authors	Title
14:00	14:30	Piero COLLI FRANZONE Luca F. PAVARINO , Bruno TACCARDI	Heterogeneity of the Ventricular Action Potential Durations: a Simulation
14:30	15:00	Shigehiro MIURA , Tetsuya SHIMOKAWA , Taishin NOMURA	Stochastic Simulations on a Model of Circadian Rhythm Generation
15:00	15:30	Gianpaolo SCALIA TOMBA	The Statistics of Generation Times in Epidemic Spread Models
15:30	16:00	Paolo ABUNDO Mario ABUNDO Nicola ROSATO	A Stochastic Model for Infective Events in Operating Room Caused by Air Contamination
16:00	16:30		Coffee Break

CHAIR: Roman BORISYUK

From	To	Speaker and Co-authors	Title
16:30	17:00	Riccardo BARBIERI , Emery N. BROWN	Point Process Bayesian Models: Applications on Cardiovascular Control and Neural Information Encoding
17:00	17:30	Franco CAVALLI , Andrea. GAMBA , Giovanni NALDI , Matteo SEMPLICE	3D Simulations of Early Blood Vessel Formation
17:30	18:00	Miguel LARA-APARICIO Carolina , ARRIGA-MONTOYA Beatriz FUENTES-PARDO	A Mathematical Model of the Circadian Activity Induced by the Presence of Sexual Hormones in Male Crayfish
18:00	18:30	Andrew MOROZOV , Elena ARASHKEVICH	Influence of Spatial Heterogeneity on the Type of Zooplankton Functional Response
18:30	19:00	Daniela MORALE , Vincenzo CAPASSO	Stochastic Models of Self-Organizing Biological Entities

Room E: Brain Function and Neuronal Modeling

CHAIR: Péter ÉRDI

From	To	Speaker and Co-authors	Title
11:30	12:00	Henry C. TUCKWELL	Point Process Bayesian Models: Applications on Cardiovascular Control and Neural Information Encoding
12:00	12:30	Dante R. CHIALVO	On What the Brain Does Even Before Doing Anything: Balanced Correlations in Large-Scale Resting State Brain Networks
12:30	13:00	Hans A. BRAUN Bastian T. WOLLWEBER , Svetlana POSTNOVA Horst SCHNEIDER Marcus , BELKE Karlheinz VOIGT Martin T. HUBER	Neural Control of Autonomous and Mental Functions: The Interplay of Nonlinear Positive and Negative Feedback Loops with Noise
13:00	14:00		Lunch Break

CHAIR: Petr LÁNSKÝ

From	To	Speaker and Co-authors	Title
14:00	14:30	Péter ÉRDI , Brad FLAUGHER , Trevor JONES Balázs UJFALUSSY , László ZALÁNYI , Vaibhav DIWADKAR	Computational Approach to Schizophrenia: Disconnection Syndrome and Dynamical Pharmacology
14:30	15:00	Maxim BAZHENOV	Oscillatory Synchronization and Information Coding in the Olfactory System
15:00	15:30	Svetlana POSTNOVA Karlheinz VOIGT , Hans A. BRAUN	Neural Synchronization at Tonic to Bursting Transition
15:30	16:00	Takashi KOHNO , Kazuyuki AIHARA	A Design Method for Analog and Digital Silicon Neurons – Mathematical-Model-Based Method -
16:00	16:30		Coffee Break

CHAIR: Roberto MORENO-DIAZ

From	To	Speaker and Co-authors	Title
16:30	17:00	Petr LÁNSKÝ	Parameters of Simple Neuronal Models
17:00	17:30	Reinhard HÖPFNER	Estimating Diffusion Coefficient and Drift in a Set of Neuronal Data
17:30	18:00	Susanne DITLEVSEN Petr LÁNSKÝ Ove , DITLEVSEN	Parameters of Stochastic Diffusion Processes Estimated from Observations of First Hitting-Times: Application to the Leaky Integrate-and-Fire Neuronal
18:00	18:30	Eugene M. IZHIKEVICH	How Do We Learn? Rewarding Spiking Networks

20:00：(Banquet

THURSDAY, SEPTEMBER 27

Room F: Plenary Session

CHAIR:Alan HASTINGS

From	To	Speaker and Co-authors	Title
9.00	9.50	Simon A. LEVIN	The Emergence of Collective-Decision Making
9.50	10.20	Andrea PUGLIESE	Charles Darwin and his Inspirations

Room F: Ratchets

CHAIR: Peter TALKNER

From	To	Speaker and Co-authors	Title
11:10	11:40	Mario SALERNO	Parameters of Simple Neuronal Models
11:40	12:10	Yoshiharu ISHII , Mitsuhiro IWAKI , Yuichi TANIGUCHI , Toshio YANAGIDA	Biased Step Movement of Molecular Motors
12:10	12:40	Testuya SHIMOKAWA Kazunari MOURI	The Cooperative Effect on the Coupled Ratchet-Type Molecular Motor Model
13:00	14:00		Lunch Break

Room E: Ecology and Population Dynamics I

CHAIR: Simon LEVIN

From	To	Speaker and Co-authors	Title
10:20	10:50	Daniel GRÜNBAUM　Speaker	Towards a Synthesis of Coordinated Movements in Biological Groups: Individuals, Groups and Populations
10:50	11:10		Coffee Break

CHAIR: Nanako SHIGESADA

From	To	Speaker and Co-authors	Title
11:10	11:40	Frederic BARTUMEUS Simon LEVIN	Chance and Necessity: Evolutionary Insights in Animal Search Strategies
10:40	12:10	Alan HASTINGS , Louis W.BOTSFORD	Persistence and Models for the Design of Marine Protected Areas
12:10	12:40	Irene GIARDINA , Andrea CAVAGNA , Alberto ORLANDI , Giorgio PARISI , Andrea PROCACCINI ,　Massimiliano VIALE , Vladimir ZDRAVKOVIC , Michele BALLERINI , Nicola CABIBBO , Raphael CANDELIER , Evaristo CISBANI	Collective Behaviour in Starling Flocks: Understanding Patterns of Animal Group Movement
13:00	14:00		Lunch Break

15:00-19:00：Informal Discussions and Optional Sightseeing

FRIDAY, SEPTEMBER 28

Room F: Plenary Session

CHAIR: Imre DERÉNYI

From	To	Speaker and Co-authors	Title
9:00	9:50	Dean ASTUMIAN	Symmetry Relations for Trajectories of a Brownian Motor
9:50	10:40	Marcelo MAGNASCO	Sparse Time-Frequency Representations and the Neural Coding of Sound
10:40	11:10		Coffee Break

CHAIR: Luigi M. RICCIARDI

From	To	Speaker and Co-authors	Title
11:00	12:00	Takeyuki HIDA	White Noise Approach to Random Fields Describing Biological Phenomena
12:00	12:30	Luigi M. RICCIARDI	Communication and Thanks
13:00	14:00		Lunch Break

Room F: Networks and Biosystems

CHAIR: Taishin NOMURA

From	To	Speaker and Co-authors	Title
14:00	14:30	Kenji MATSUMOTO , Seiji TAKAGI , Toshiyuki NAKAGAKI	Locomotive Mechanism of Physarum Plasmodia Based on Spatiotemporal Analysis of Protoplasmic Streaming
14:30	15:00	Seiji TAKAGI	Various Dynamic Patterns in the Thickness Oscillation by the True Slime Mold
15:00	15:30	Atsushi TERO , Toshiyuki NAKAGAKI , Ryo KOBAYASHI	Solving Minimum Steiner Tree Problem with Physarum Solver
15:30	16:00	Ikkyu AIHARA , Hiroyuki KITAHATA , Kenichi YOSHIKAWA , Kazuyuki AIHARA	Experimental and Theoretical Studies on Competition and Cooperation of Calling Behavior in Japanese Tree Frogs
16:00	16:30		Coffee Break

CHAIR: Martin BIER

From	To	Speaker and Co-authors	Title
16:30	17:00	Imre DERÉNYI , Gergely PALLA , Illés FARKAS , Tamás VICSEK	Uncovering the Overlapping Community Structure of Complex Networks in Nature and Society Title
17:00	17:30	Leone MONTAGNINI	Philosophical Approaches towards Sciences of Life in Early Cybernetics

Room E: Ecology and Population Dynamics □

CHAIR: Masayasu MIMURA

From	To	Speaker and Co-authors	Title
14:00	14:30	Nanako SHIGESADA , Noriko KINEZAKI , Kohkichi KAWASAKI	Spatio-Temporal Patterns of Invading Species in Fragmented Environments
14:30	15:00	Hiromi SENO , Tsutomu MATSUOKA	Indirect Effect May Cause the Paradox of Pest Control
15:00	15:30	Donald B. OLSON , Ashley MCCREA STRUB Carlos LACIANA	Competition in Harvesting Systems
15:30	16:00	Géza MESZÉNA	Competition and Coexistence: Why more than one Species Exist?
16:00	16:30		Coffee Break

CHAIR: Gianpaolo SCALIA TOMBA

From	To	Speaker and Co-authors	Title
16:30	17:00	Jeff MOEHLIS , Allison KOLPAS Ioannis	Coarse-Grained Analysis of Stochasticity- Induced Switching between Collective Motion States
17:00	17:30	Horst MALCHOW , Ivo SIEKMANN , Michael SIEBER	Spatiotemporal Pattern Formation in Predation-Diffusion Systems with Infected Prey
17:30	18:00	Franco PELLEREY , José Maria FERNANDEZ -PONCE	Bisexual Calton-Watson Branching Processes in Random Environments
18:00	18:30	Mannuel FALCONI	Periodic Orbits in Predator-Prey System

(Ⅱ) The 7th International Conference on Optimization (ICOTA 7)

Communicates by Wuyi Yue**

The 7th International Conference on Optimization(ICOTA 7) : Techniques and applications
December 12-December 15, 2007, International Conference Center, Kobe, Japan
ICOTA webpage is: http://www.iict.konan-u.ac.jp/ICOTA7/
See also pages 8 of Notices from the ISMS, November 2006.

(Ⅲ) Conferences for Young Algebraists

Klaus Denecke***

The following list gives some information on the future conferences of young algebraists:

1. AAA Linz (Austria), May 22-25, 2008
2. CYA (77. AAA), Potsdam, Februar 2009
   (dedicated to K. Denecke)
3. AAA Bern (Switzerland), June 11-14, 2009
4. CYA (79. AAA), Olomouc (Czech Republic), February 2010

See also pages 10 and 11 of Notices from the ISMS, January 2007.

(Ⅳ) Announcement of Meetings in Topology

Communicated by Gerhard Preuss*

1) December 3-7, 2007:
International Conference on Topology and its Applications 2007
(Jointly with 4th Japan Mexico Topology Conference)
Department of Mathematics, Kyoto University, Kitashirakawa-Oiwakecho,
Sakyoku, Kyoto, Japan

Organizing Committee:
Chair:
Akira Kono (Kyoto University)
Salvador Garcia-Ferreira (UNAM)
Algebraic Topology:
Norio Iwase (Kyushu University)
Miguel A. Xicote'ncatl (CINVESTAV) xico at math.cinvestav.mx
Knot Theory:
Akio Kawauchi (Osaka City University)
Mario Eudave (Instituto de Matematicas-UNAM)
Set Theory, Set-theoretic Topology:
Tsugunori Nogura (Ehime University)
Angel Tamariz-Mascarua (Facultad de Ciencias-UNAM)
Diego Rebolledo-Rojas (Instituto de Matematicas-UNAM)
Geometric Topology, Continuum Theory:
Hisao Kato (Tsukuba University)
Sergey Antonyan (Facultad de Ciencias-UNAM)
Alejandro Illanes (Instituto de Matematicas-UNAM)
Dynamical System:
Hiroshi Kokubu (Kyoto University)

See: http://www.math.sci.ehime-u.ac.jp/jamex/

** Wuyi Yue is a professor of Konan University, an editor of SCMJ, and an editor of Notice from the ISMS.

***Klaus Denecke is a professor of University of Potsdam, Institute of Mathematics, an Editor of SCMJ, and an Editor of Notices from the ISMS.

*Gerhard Preuss is a professor of Freie Universität Berlin, FB Mathematik, an Editor of SCMJ, and an

Editor of Notices from the ISMS.
2) June 9-19, 2008
Advances in Set-Theoretic Topology
in Honour of Tsugunori Nogura on his 60th Birthday
Centre for Scientific Culture "Ettore Majorana"
International School of Mathematics "G. Stampacchia"
Erice, Sicily, Italy

Organizers:
Szymon Dolecki (Burgundy University, France)
Yasunao Hattori (Shimane University, Japan)
Dmitri Shakhmatov (Ehime University, Japan)
Gino Tironi (University of Trieste, Italy)

Topics:
Convergence properties and convergence structures;
Dimension theory and related fields;
General topology and its applications in other areas of mathematics;
Hyperspaces, set-valued mapping and their selections;
Set theoretic methods in mathematics;
Topological algebra (topological groups, functions spaces, etc...).

See: http://www.math.sci.ehime-u.ac.jp/erice/

(V)Call for Proposals and Organizers for Special Sessions in IVMS 2008 and IVMS 2009

The ISMS holds inter-regional videoconference via internet. The first videoconference was held in December 2003, the second in June 2004, and the third in March 2005. We are planning a videoconferencing system that will be able to connect up to four research sites, at present. Therefore presenters may be asked to travel to one of these local sites in order to present. The international videoconference consists of special sessions only. These sessions will be devoted to special fields of study, for example Fixed point theory and its applications. Each session's organizers will decide the type of the videoconference: presentation of original papers (contributed and/or invited papers)and/or expository articles, or tutorials. Speakers of the session can write on a white board or an OHP sheet, or can use Power Point. Participants can ask questions or make comments. All these are performed similarly to the traditional meetings. Organizers of the sessions chair their meeting at their co-ordination sites and can turn the speakers' sites.

Time differences between local sites will become an important factor. Please note the following possibilities:

There are three combinations of connections for inter-regional videoconferences:

(1) Europe (morning) – Asia(evening) for 4hours from 08:30(GT) to 12:30(GT)
(2) Asia(morning)- West coast area of USA(evening) for 4hours from 23:30(GT) to 03:30(GT)
(3) Asia(around noon)-Asia(evening) for 4hours from 16:00(GT) to 20:30(GT)

Every IVMS is performed through three steps.

(1) Trial of link in advance between (1) organizer and Osaka Nakanoshima Center(ONC)and (2) co-organizer and ONC are recommended.
(2) In the first step, all papers are presented on the homepages of the ISMS. (http;//www.jams.or.jp/ivms/index-ivms.html)
(3) In the second step of the IVMS, all papers are presented similarly to the usual assembly type meeting via internet, often using CD-ROMs or DVDs which are sent beforehand, when the author can't use VC system via internet.

Scheme of Videoconference

1)Videoconference System

In order to have a videoconference with us, your institutions should have one of the following in the descending order of desirability.

1. Videoconference room
2. Facilities for distance learning
3. Facilities in computer centers

Making use of one of the above, your institutions can be connected with our system(TANDBERG 6000 or TANDBERG 550) at Nakanoshima Center of Osaka University as far as your system satisfies the following ITU-T standards.

International Standards of Videoconference System

ITU-T	over IP H.323
Video Coding	H.261, H.263
Audio Coding	G.711, G.723 G.722, G.728
Multiplexing (Mux/Demux)	H.225
System Control	H.245
Transmission Rate	64kbps 128kbps 384kbps

Image dimensions: CIF:352×288, QCIF:176×144, SQCIF:128×96

The following products are assured to be able to be connected with our "TANDBERG 6000".

H.323 Endpoints(over IP)
Equipment Software Revision
Polycom View Station 512MP 7.0.1, 7.2.4, Polycom ViewStation FX 4.2,5.0
Polycom Via Video 5.0,PictureTel 970 5.0.0.415,PictureTel 680 5.0.0.415
PictureTel(Intel) TeamStation 4.0a,Microsoft NetMeeting 3.01
VCON Vigo 4.6, VCON Falcon 0300.M07.D28.H11, VCON Cruiser 384 4.6
VTEL Galaxy 2.2.0.070, Sony PCS-1600 3.10, Sony PCS-6000 5.00
D-Lonk i2Eye 2.0.0.20

2) Organizers
Organizers should appoint invited speakers and call for papers for their sessions. The selection of the papers is left to the organizers' own choice. They should inform the ISMS of their programs with the titles, author's names of the papers. They should send the following "Form of Application of Organizers" to the ISMS.

3) Application Form for Organizers
Every organizer should inform the following data to the ISMS program committee
(Through the homepage of the ISMS. http://www.jams.or.jp/hp/ivms_orhanizers.html)

1. Name of the organizer
2. E-mail address
3. Title of the planned special session
4. Names of the co-organizers of the joint universities/societies and their affiliations, if any.
5. Name(s) of the invited speakers, if any.

4) Participation
Individuals who wish to participate the videoconference can designate a session or sessions in which they are going to participate.

(1) For participants, these can be five sites that are connected with our key site simultaneously. The foreign participants can go to the nearest university announced on our web page as the joining sites.
(2) The application for participation can be made on the web inputting the required data in the registration form on the ISMS homepage.
(http://www.jams.or.jp/hp/ivms_organizers.html) or write items in the following forms and send by post to the International Society for Mathematical Sciences, 2-1-18 Minami Hanadaguchi, Sakai, Osaka 590-0075, Japan
A applicants can mail also by post the following data 5)1~5 both to the ISMS managing office and to the organizer of the session in which they wish to participate.
(3) The participation fee to cover the head office cost is free. Please note that local sites may request an additional fee to cover local costs.
(4) The ISMS will give a password to the participants to enter the session of the web.

5) Presentation on the WWW
Programs, abstracts of the papers, (and the full text of the papers)if the author wishes of each session will be located beforehand on the web.

6) Connection Test on March 29, 2008: 15:30-17:00 (Japan time) on March 29, 2008 ((See (III) on the page 17))

7) Publication in SCMJ
Authors should designate one of the editors and send their papers both to the editor and to our office. In the case of the papers to be presented in IVMS, the organizers, the co-organizers and the invited speakers can, upon their approval, referee in place of the editors. The editorial board expects this will ensure the papers to be refereed quickly and published adequately.

8) ISMS (JAMS) Prize Winners
Winners of ISMS (JAMS) Prize can give their lectures or speeches at IVMS if they wish.

9) FAQ about videoconference
(Question 1) Where do the authors (lectures, speakers) present his/her paper in the videoconference?
(Question 2) Is there any limitation to the length of the lecture?
(Question 3) Can the authors make lectures using OHP?
(Question 4) What should the authors do expect for making lectures?
(Question 5) Is there any limitation to the length of the papers?
(Question 6) Is there any limitation to the length of the abstract?
(Answer 1) As the conference sites are announced on the web before the videoconference, the authors go to the nearest site to present their papers.
(Answer 2) It depends on the organizers of the sessions. Please ask the organizers directly. We are thinking of 30 minutes as a rough standard including questions and answers.
(Answer 3) Yes, they can. They can also use white boards. However, please ask the organizers if it is possible at their site.
(Answer 4) They should submit the papers (including abstract) for the web, which will be located on the web in advance.
(Answer 5) It depends on the organizers of the sessions. Please ask the organizers directly. We are thinking of fifteen pages as a rough standard.
(Answer 6) It should be within 20 lines in Word style.

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(VI) Tsuyoshi Fujiwara (1923−2006)

Remarks on the paper
Algebraic closures in certain elementary classes
Scientiae Mathematicae Japonicae, vol. 59 (2004)

Deirdre Haskell*

This article concerns the general question of the relation between syntactic properties of the axioms of a theory and algebraic properties of the associated class of models. This is a classical problem in model theory. Foundational results include the fact that the class of models of a theory which has purely universal axioms is preserved under submodels. By requiring more precise forms for the axioms, one can develop a more extensive theory. In this article, Fujiwara focuses attention on sentences of the form $\forall x \exists y(\varphi(x) \to \psi(x,y))$, where φ and ψ are quantifier-free formulae and ψ is positive. Examples of theories with axioms of this form include abelian groups, fields, ordered sets, semilattices.

If T is a consistent set of such sentences, then Fujiwara defines the supporting theory S_T to be the set of universal consequences of T. In the class of models of theories of the form S_T, Fujiwara develops related notions of algebraic closure and existential closure. An element b is said to be

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*Deirdre Haskell
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McMaster University, U.S.A

algebraic over a model A if the elementary diagram of $A(b)$ has a given completeness property. Existential closure is defined via formulae in $L_{\infty\omega}$. These properties of algebraic closure and existential closure are then shown to be equivalent. This result demonstrates the strength of first-order logic versus $L_{\infty\omega}$ for this particular class of models.

In the remainder of the article, Fujiwara develops further model-theoretic notions for this elementary class. In particular, he studies various restricted versions of amalgamation. He shows that whether a triple of models has such a property is again determined by syntactic properties such as consistency or completeness of the diagrams of the respective models.

Memories of Professor Tsuyoshi Fujiwara

Yoshihiro Nakano**

It was in the latter half of 1960's that I made the acquaintance of Professor Fujiwara. In those days, the research field in which I was mainly interested was the proof theory in foundations of mathematics. Particularly, I concentrated my interest on proof-theoretic studies of number theory and analysis by Géntzen and Schütte. Because of not being able to grasp the contents of the theme, I had been always put to annoyance. So to speak, I felt as if I were in a maze of the syntax. On the other hand, at this time, the development in the axiomatic set theory stimulated by P.J.Cohen's discovery had arisen, and I had found my interest in the model theory of the axiomatic set theory. Such being the case, the subject of my interest was moved on to the semantics. However, until then I was ignorant about the trend of semantics, and I had great difficulty in learning model theory by my effort alone.

Under such circumstances I heard from a friend that Professor Fujiwara was interested in a model theory, and so I came to study under him. In those days, his interest seemed to be in the syntactical characterization of the preservation of the algebraic structure. He recommended that three of my fellows and I read the draft of "Universal Algebra" of G. Gätzer. We gathered once a week and studied the text, each person lecturing a part of it in turn. The study meeting was severe but pleasant. Particularly, Professor Fujiwara's concluding remarks at every session were fresh and stimulating for me in that it gave me the clear and suggestive image of contents.

In the field of the model theory, M.Morley's "Categoricity in Power" had already been announced two years before, but it did not become to be the object of interest in our circle. "To follow one's own instincts, to use one's own reason, and to come to one's own conclusions" was the basic posture of Professor Fujiwara.

Meanwhile, I noticed a fact with respect to the freeness notion in the algebraic system, that is, a common phenomenon among the completeness, the compactness with respect to the deducibility, and freeness in the algebraic structures. Professor Fujiwara suggested me that, by using this, investigating the features of the free structure, the direct product, and the direct limit of the direct system may be an interesting theme. With the aid of his suggestion, I was able to produce a few results with respect to the direct limit.

Before long, I was transferred to Yamaguchi University. By that time, the number of the universities in a storm of student revolution had been increased all over the country, and the storm at Yamaguchi University was at its peak then. As a result, I was compelled to put my research activities aside and to busy myself in dealing with the situation around the university education. On the other hand, in addition my interest of research was transferred to a model theory of a set theory from an algebraic model theory. So, I came to gradually keep silence for a long time with him. However, I have heard that without losing his interest he continued his research activities for all his life.

Professor Fujiwara was not tied down the ideas or the techniques that other persons developed. He was quiet, but the posture that pursued his own idea thoroughly was impressive. When I think of his life, I recollect the following phrase:

"To taste the full joy of exploration it is not necessary to go to the ends of the earth. Such adventures are reserved for the giants among us. There is a vast world of interest at our very doors which, to be understood and enjoyed, must be discovered anew by each one of us individually."

** Yoshihiro Nakano (P.E. Yamaguchi University, Japan)

The ISMS
(Ⅰ) International Society for Mathematical Sciences
----- Contributions

Dear Colleagues and Friends,

In September 2007, we establish the following two funds.

(1) **International ISMS Prizes Fund**
in order to award the prizes for the original papers or survey works published in Scientiae Mathematicae Japonicae or Notices from the ISMS.

(2) **International Research Promoting Fund**
in order to promote and support international joint meetings by IVMS.

The contributions are classified into the following five categories.

(A) ¥ 500,000 (or $5,000) and above
(B) ¥ 100,000 (or $1,000) and above
(C) ¥ 50,000 (or $500) and above
(D) ¥ 10,000 (or $100) and above
(E) Less than ¥10,000 (or $100)

We deeply appreciate your generous contributions to support the above activities of our society.

Your remittance to the following accounts of ours will be much appreciated.

(1) Through a post office, remit to our giro account (in Yen only):
No. 00930-1-11872, Japanese association of Mathematical Sciences (JAMS)
or send International Postal Money Order (in US Dollar or in Yen) to our address:
International Society for Mathematical Sciences
2-1-18 Minami Hanadaguchi, Sakai, Osaka 590-0075, Japan

(2) Through a bank, make remittance to the following account of JAMS.
A/C 94103518
CITIBANK, Japan Ltd., Shinsaibashi Branch
Midosuji Diamond Building
2-1-2 Nishi Shinsaibashi, Chuo-ku, Osaka 542-0086, Japan

Kiyoshi Iseki
Tadashige Ishihara

(Ⅱ) Result of Confidence Vote October 1, and October 10, 2007

The vote was made on the www by e-mail to "pgp7j@jams.jp".The results for 5 candidates are Yes 19 and No 0, for 13 candidates are Yes 18 and No 0. So all officers and Council members are confident.

	Yes	No
5 candidates	19	0
13 candidates	18	0

(Ⅲ)Business Meeting (2008) and IVMS

The business meeting (2008) will be held on March 29, at Osaka University Nakanoshima Center as follows.

Data: March 29, 2008
Place: 7F Seminar Room at Osaka University Nakanoshima Center
Time: 13:00-14:00(Japan Time)… **business meeting Test and IVMS Test** among joining Universities
14:00-15:30(Japan Time)… business meeting
Agenda: 1. Financial Report for the fiscal year 2007
2. Budget for the fiscal year 2008
3. Bylaws 2008
4. Miscellaneous
15:30-17:00(Japan Time)… IVMS among proposed Universities

Call for ISMS Members
Call for Academic and Institutional Members

Discounted subscription price: When organizations become the Academic and Institutional Members of the ISMS, they can subscribe our journal Scientiae Mathematicae Japonicae at the yearly price of US$300. At this price, they can add the subscription of the online version upon their request.

Invitation of two associate members: We would like to invite two persons from the organizations to the associate members with no membership fees. The two persons will enjoy almost the same privileges as the individual members do including the discount of the page charge. Although the associate members cannot have their own ID Name and Password to read the online version of SCMJ, they can read the online version of SCMJ at their organization.

To apply for the Academic and Institutional Member of ISMS, please use the following application form.

Application for Academic and Institutional Member of ISMS

Subscription of SCMJ Check one of the two.	☐Print (US$300)	☐Print ＋ Online (US$300)
University (Institution)		
Department		
Postal Address where SCMJ should be sent		
E-mail address		
Person in charge	Name: Signature:	
Payment Check one of the two.	☐Bank transfer	☐Credit Card (Visa, Master)
Name of Associate Membership	1.	
	2.	

Call for regular Members
ISMS Membership Dues from 2007

A new category "life member" has been established and can be applied for from 2005. An eligible member may become a life member by making a one-time payment of dues. A member who has been an ISMS member for ten years or more is eligible for a life member. The amounts of dues are : ¥70,000 for the domestic members, US$ 600 (€480)for the foreign members, and US$ 500 (€400)for the members in developing countries.

We have reduced the ISMS membership dues since 2001 and copies of the printed journal have not been distributed to the members, free of charge. Instead, we give User Name and Password to each member so that he/she can view or print out the full text of the papers published in SCMJ except papers in the international plaza from our Web site (http://www.jams.or.jp).

The Membership Dues for each category is as follows. Applications for the 3-year members can be made only in 2005 and in every three years.

Membership Dues for 2007

Membership	JAPAN	S-JAPAN	Foreign	S-Foreign	Developing
1-year	A1 ¥7,000	SA1 ¥3,500	F1 US$50 €40	SF1 US$30 €24	D1 US$30 €24
3-year	A3 ¥18,000	SA3 ¥9,000	F3 US$120 €96	SF3 US$60 €48	D3 US$70 €56
Life Member	Life ¥70,000	Life ¥70,000	FL US$600 €480	FL US$600 €480	DL US$500 €400

Category D is for those who reside in the countries of Eastern Europe, CIS or developing countries. Category S is for students and for the aged (older than 70). The figure 1 and 3 means a year and 3 years respectively.

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Payment Instructions

Payment can be made through a post office or a bank, or by credit card. Members may choose the most convenient way of remittance. Please note that we do not accept payment by bank drafts (checks). For more information, please refer to an invoice.

Methods of Overseas Payment:

Payment can be made through (1) a post office, (2) a bank, (3) by credit card, or (4) UNESCO Coupons.

Authors or members may choose the most convenient way of remittance as are shown below. Please note that **we do not accept payment by bank drafts (checks)**.

(1) Remittance through a post office to our giro account No. 00930-1-11872 or send International Postal Money Order to our postal address (2) Remittance through a bank to our account No. 94103518 at Shinsaibashi Branch of CITIBANK (3) **Payment by credit cards** (AMEX, VISA, MASTER or NICOS), or (4) Payment by UNESCO Coupons.

Methods of Domestic Payment:

Make remittance
(1) to our Post Office Transfer Account - 00930-3-73982 or
(2) to our account No.1565679 at SUMITOMO BANK, Sakai, Osaka, Japan.
All the correspondences concerning subscriptions, back numbers, individual and institutional memberships, should be addressed to the Publications Department, International Society for Mathematical Sciences.

Membership Application Form (from 2007 September)

To determine what membership category you are eligible for, read "Join ISMS" on the inside of the back cover.

1. Name: Family Name, First Name, Middle Name (in this order)
2. Home Address
3. Name of Firm or Institution affiliation
4. Postal address to which correspondence should be sent
5. e-mail address
6. Telephone Number, Fax Number
7. Membership Category
8. Panel (Please choose one out of the following 14panels in the page 26 and write the panel number. You could choose one or more.)
9. Would you like to buy the printed copies of SCMJ, whose prices a year are US$60(6,000yen) for 1-year-members(A1, D1, S-A1, S-D1)and US$55(5,500yen) for 4-year-members(A4, D4, S-A4, S-D4) ? Type YES or NO.
10. If you apply for an aged member (70 years old or over), please type the year of your birth.
11. If you wish to be a student member, please verify.
12. Is your university (institution) an Academic or Institutional Member of the ISMS? Yes or No.
13. If the answer of 12 is Yes, please answer the following. Are you designated associate member by your university (institution)?
14. Date
15. Signature

For Japanese Applicants, please send two application forms, one in English and the other in Japanese.

I wish to enroll as a member of ISMS and will pay to International Society for Mathematical Sciences the annual dues upon presentation of an invoice. Copies of Mathematica Japonica, Scientiae Mathematicae and Scientiae Mathematicae Japonicae received as an ISMS member will be for my personal use and shall not be placed in institutional, university or other libraries or organizations, nor can membership subscriptions be used for library purposes.

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Join ISMS !

ISMS Publications: We published **Mathematica Japonica (M.J.)**, which enjoyed an international reputation, for about sixty years in print and its offshoot **Scientiae Mathematicae (SCM)** both online and in print. In January 2001, the two publications were unified and changed to **Scientiae Mathematicae Japonicae (SCMJ)**, which is the "21st Century New Unified Series of Mathematica Japonica and Scientiae Mathematicae" and published both online and in print. Ahead of this, the online version of SCMJ was first published in September 2000. The number of the annual total pages of the print version has been from 900 to 1,200 pages in six issues since January 1978. The whole number of SCMJ exceeds 240, which is the largest amount in the publications of mathematical sciences in Japan. The features of SCMJ are:

1) About 90 eminent professors and researchers of not only Japan but also 20 foreign countries join the Editorial Board. The submitted papers are received directly by the editors and are refereed quickly. The accepted papers are published online with no lead time after compiling or proofreading. SCMJ is reviewed by Mathematical Review and Zentralblatt from cover to cover.
2) SCMJ is distributed to many libraries of the world. The papers in SCMJ are introduced to the relevant research groups for the positive exchanges between researchers.
3) The original papers and surveys of distinguished mathematical scientist appear in every issue of SCMJ. The section called "International Plaza" of SCMJ has very interesting expository papers written by the eminent mathematical scientist of the world. Presentations of recent research frontier including award lectures by the winners of the ISMS Prize or Shimizu Prize are made.
4) **ISMS Annual Meeting:** Many researchers of ISMS members and non-members gather and take time to make presentations and discussions in their research groups every year.
5) The ISMS holds inter-regional videoconferences called **International Videoconference of Mathematical Sciences (IVMS)** via internet. There is no need for the participants to travel abroad.

Privileges to ISMS Members: (1) Free access (**including printing out**) to the online version of SCMJ, (2)Discounted price for the printed version of SCMJ (See **Table 1**), (3) Discounted page charges (See **Table 2**).

Privileges to Institutional Members: (1) Two associate members can be registered, free of charge, from an institution. (2) The discounted page charges (Table 2) are applied to the associate members.

Table 1: Subscription Price (from 2007)

	Individual 1-year mem.	Individual 3-year mem.	Institutional member	List Price
Print / year	￥6,000 US$60, €48	￥5,500 * US$55, €44	￥33,000 US$300, €240	￥45,000 US$400, €320
Online/year	Free	Free	—	—
Online+Print / year	￥6,000 US$60, €48	￥5,500 * US$55, €44	￥33,000 US$300, €240	￥45,000 US$400, €320

Postal charge is US$2 (€1.6) per issue. *In case three-year members make the payment at a time in advance, the price for 3 years is ￥15,000 (US$150, €120). The authors can buy a copy of the print version at a price of ￥1,200 (US$12) per issue including postage.

Table 2: Page Charge per printed page

	Individual/Associate Member	Non Member
Paper : P	￥3,850 (US$35, €28)	￥4,450 (US$43、€35)
TeX: T	￥2,200 (US$18, €14)	￥2,800 (US$26, €21)
ISMS style: Js	￥1,100 (US$8, €7)	￥1,700 (US$16, €14)

The above page charges include 20 offprints.

Table 3: Membership Dues for this year

Categories	Domestic	Overseas	Developing countries
1-year member (1A)	A1: ￥7,000	F1: US$50 , €40	D1: US$30, €24
3-year member (3A)	A3: ￥18,000	F3: US$120, €96	D3: US$70, €56
1-year students or aged (1S)	SA1: ￥3,500	SF1: US$30, €24	SD1: US$20, €16
3-year students or aged (3S)	SA3: ￥9,000	SF3: US$70, €56	SD3: US$50, €40
Life member* (L)	AL: ￥70,000	FL: US$600, €480	DL: US$500, €400

*The members who have been the ISMS members for more than 10 years are eligible for this category. The categories 1S and 3S are for students or persons over 70 years old.

International Society for Mathematical Sciences
----- Contributions

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(1) International ISMS Prizes Fund
in order to award the prizes for the original papers or survey works published in Scientiae Mathematicae Japonicae or Notices from the ISMS.
(2) International Research Promoting Fund
in order to promote and support international joint meetings by IVMS.
(3) Fund for Invited Authors
in order to enhance the section called "Articles" in the Notices from the ISMS and the section called "International Plaze" in the SCMJ.
(4) Fund for Keynote Speakers
in order to support keynote speakers in IVMS.

The contributions are classified into the following five categories.

(A) ¥500,000 (or $5,000) and above
(B) ¥100,000 (or $1,000) and above
(C) ¥50,000 (or $500) and above
(D) ¥10,000 (or $100) and above
(E) Less than ¥10,000 (or $100)

We deeply appreciate your thoughtfulness to support the above activities of our society.

The contributors can designate one of the above **funds (1-4)** or
(5) Any purposes.
For remittance instructions, please refer to the page 17.