

observed by him was also very high (80–95), as observed by us.

The successful use of a marine catfish pituitary glands for induced breeding of a freshwater catfish is of great significance. The shortage of pituitary glands is often quoted as an important factor holding up large scale production of quality fish seed of Indian major carps by induced breeding. As different species of marine catfish are landed in large numbers along both the coasts of India, utilization of pituitary glands from these for induced breeding of Indian major carps, if proved successful, will substantially help the quality fish seed production programme of the country.

#### ACKNOWLEDGEMENT

The authors are grateful to Shri H. P. C. Shetty, Director of Instruction, Fisheries College, for the keen interest evinced in these studies and for his suggestions for the improvement of the manuscript.

1. Alikunhi, K. H., Vijayalakshmanan, M. A. and Ibrahim, K. H., *Indian J. Fish.*, 1960, 1 (1), 1.
2. Carreon, J. A., "Induced breeding of catfish," *FAO, Aquaculture Bulletin*, 1972, 4 (2), 3.
3. Chaudhuri, H., *Indian J. Fish.*, 1960, 7 (1), 20.
4. Lakshmanan, M. A. V., Sukumaran, K. K., Murthy, D. S., Chakraborty, D. P. and Philipose, M. T., *J. Inland Fish. Soc. India*, 1971, 3, 1.
5. Sidthimunka, A., Sanglert, J. and Pawapootanon, O., "The culture of catfish (*Clarias* spp.) in Thailand," *FAO World Symposium on Warm-Water Pond Fish Culture*, 1966, 44 (5), 196.
6. Sundararaj, B. I. and Goswami, S. V., "Techniques of hypophysation of catfishes," *FAO/UNDP Regional Seminar on Induced Breeding of Cultivated Fishes, FRI/IBCF/15*, 1969, p. 23.
7. Tonsanga, S., Sidthimunka, A. and Menasaveta, D., "Induced spawning of catfish (*Clarias macrocephalus* Gunter) by hormone injection," *IPFC., FRO, Bangkok, Thailand*.

### XIII INTERNATIONAL CONGRESS ON THEORETICAL AND APPLIED MECHANICS

THE XIII International Congress on Theoretical and Applied Mechanics was held from August 21 to August 26, 1972, at the University of Moscow, Moscow. It was attended by nearly 2,000 scientists and engineers from all parts of the world. About 228 papers were read on solid and fluid mechanics, control theory, bio-mechanics and electrohydrodynamics. Five general lectures, 20 sectional lectures and 3 round-table conferences were held. About 200 contributed papers were presented in six parallel sessions.

On the opening day on August 21, an anniversary volume was presented to N. I. Muskhelishvili in honour of his 80th birthday. It contained contributions from scientists all over the world.

The inaugural address was given on August 21 in the Assembly Hall of the Moscow University by V. V. Novozhilov on the prospects of the phenomenological approach to the problem of fracture. He made out that the theory of fracture, like that of plasticity, should be based on the differential (non-holonomic) equations rather than algebraic relations. The simplest form of this theory may be expressed by the equation

$$dV/d\lambda = F$$

where  $\lambda$  is a monotonically increasing parameter describing the length of the process and  $F$  is the function of parameters, describing the process.

$V$  is a measure of damages ( $0 \leq V \leq 1$ ) (the equality  $V = 1$  is the fracture criterion).

Any progress in the practical field will be achieved by the gradual improvement of the known theories of the strength of materials, that is, by proceedings from particular solutions to general principles as in plasticity and creep.

In the second general lecture, M. J. Lighthill dealt with aquatic animal locomotion, both at low and at high Reynolds numbers. He pointed out that recent hydromechanical studies have revealed that all the fastest aquatic animals have, in the evolutionary sense, converged upon an identical propulsive system.

B. M. Fraeijs de Veubeke gave an exhaustive account of the finite element method in the analysis of structures, which can easily take care of structural discontinuities, either in design theory parameters or in material properties.

K. Wieghardt described the theoretical methods used in ship hydrodynamics. Potential flows without or with free surface, gravity and free vortex sheets describe successfully a number of problems, but the resistance of a ship in calm water is still to be found out experimentally by model tests.

The sectional lectures dealt with problems of creep, tornado dynamics, gas dynamics, shell theory, electrohydrodynamics, porous media and non-linear continuum mechanics.

George F. Carrier gave an analytical schematic analysis and the heat transfer and thermodynamic behaviour in the updraft region of a tornado. J. P. Guiraud pointed out that the mathematical theory of the compressible Navier-Stokes equations was practically void even in the linear framework as compared to the exhaustive literature available for incompressible fluids. This is due to the difficulty experienced in passing from kinetic theory to gas dynamics.

Nocholas J. Hoff dealt with creep buckling of plates and shells. He showed that in most cases a creep buckling analysis based on secondary creep was found to be sufficient. This cannot give the point of inflexion before creep rupture. W. T. Koiter gave the five main lines of attack to strengthen the foundations of shell theory. J. R. Melcher analysed the microscopic coupling between electric fields and fluids and described the work done on the following problems :

(i) Purely polarization forces ; (ii) interactions with monolayers of charge ; (iii) volume free-charge forces ; (iv) interactions with double-layers of charge.

L. I. Sodov reviewed the non-steady flow of water at high speeds. He showed that artificial cavities can develop behind disks and cones, and presented various models of liquid with bubbles. I. N. Vekua showed that in some problems of 3-dimensional shell theory we get an elliptic system

of the 10th order. In case of an arbitrary shell the system can be reduced to the plate problem if isometric co-ordinates of the middle surface are used as Gaussian parameters and successive approximations are applied.

The three round-table conferences dealt with fracture, industrial fluid mechanics, optimization process and applied mechanical systems.

The contributed papers treated elasticity, plasticity, viscoelasticity, fracture, gas dynamics, turbulence, wing theory, hydrodynamics stability and optimal structures. Even though the Congress dealt with some modern subjects like electrohydrodynamics and biomechanics, it broke very few new grounds. Subjects, like transitions, which occur in all modern problems of high speed technology, were hardly touched. They need global treatment and can help to reduce the ever-increasing number of semi-empirical laws and *ad hoc* assumptions.

Social programmes included a Reception at the Kremlin Palace of Congresses, Congress banquet at Arbat Restaurant and a Reception by U.S.S.R. Academy of Sciences.

Prof. H. Görtler was elected as the President of International Union of Theoretical and Applied Mechanics (IUTAM) for the next four years. The XIV Congress will be held in Montreal in 1976.

B. R. SETH.

Birla Institute of Technology,  
Mesra, Ranchi

## WANTED

APPLICATIONS are invited from suitable candidates who are willing and desirous of undertaking the work of an Executive Editor, Current Science, on a whole-time basis. Salary grade attached to the post is Rs. 400-40-800-50-950 and a higher start will be considered in deserving cases. Usual allowances admissible under Government rules will be paid.

Please state academic qualifications, age, previous experience and salary expected in the application.

Last date for receiving applications, which should be addressed to The Secretary, Current Science Association, Raman Research Institute, Hebbal, Bangalore-6, will be January 15, 1973.