

# NEWSLETTER

**girep**

Groupe International de recherche sur l'enseignement de la physique  
International research group on physics teaching  
Internationaler Arbeitskreis zur Förderung des Physikunterrichts

N. 19 - January 1988

This issue of the Newsletter is primarily concerned with giving information on:

- The state of GIREP affairs.
- Increase of the GIREP membership fee for 1988.
- The Conference on Teaching Condensed Matter, to be held in Munchen in September 1988.
- Reports of other international activities and events.

Please note, your yearfee is on the upper right-hand corner of the envelope label. The situation refers to the month of November so you may expect some inexactitude. Please check the yearfee with your records and inform the Treasurer if you find inconsistencies.

## 1. AN INCREASE IN THE ANNUAL SUBSCRIPTION FOR GIREP MEMBERSHIP TO £ST 10.00 from the GIREP Treasurer

We are sure that GIREP members will have appreciated that the GIREP subscription fee, which has remained at \$ US 10 for several years, is very low indeed.

With such a low subscription it is becoming increasingly difficult for GIREP to fulfil its statutory aims. For example, it is now quite a problem, because of our very limited funds, to organise GIREP's biannual Conferences. Indeed, it would be impossible to run such high quality conferences and send all members their free copies of the Conference Proceedings, as GIREP always does, were it not for generous financial sponsorship and other kinds of practical help from international organisations such as UNESCO and The European Space Agency, and from a variety of institutions within the countries hosting the GIREP Conferences.

The Council of GIREP have decided, in face of the increasing costs of postage and administration, and the need to be able to negotiate effectively on behalf of all GIREP members when

approaching other bodies for help to set up the GIREP Conferences, that the annual fee should be increased.

With regret, therefore, we inform members that for the year 1988 the annual fee will be:

£ 10 sterling

in sterling currency if you pay into the London account - this is the preferred method, as GIREP loses nothing in bank charges when you do so;

or

the equivalent of £st 10, after any charges have been paid to your personal bank for the transaction, please, if you pay Lire into the Italian account or if you pay Swiss Francs into the Credit Suisse account.

Please take notice of the fact that on any bank cheques or bank drafts sent to London which are made out in non-sterling currencies, there are various internationally agreed banking charges which can reduce the amount received by GIREP to less than one fifth of the amount paid by the GIREP sender. This is because even though the sums sent by individuals are small, the minimum charges are high.

A similar problem occurs when currency notes are sent. By the time conversion charges on a few dollars or francs have been paid, it is hardly worth going to the bank.

Please may I ask Newsletter readers to bear these facts in mind when they are sending in their GIREP fees? Otherwise the only people who gain, and at our expense, are the big banks.

Furthermore: please be sure that your name is always sent with your subscription, or your payment will not be acknowledged. Thank you!

Brian Davies

## 2. GIREP BALANCE, MAY 1986-MAY 1987

The following financial statement refers to the state of GIREP's accounts since the last published Balance (see Newsletter n°16 of June 1986).

As you may notice, the Balance shows a high expenditure mostly for the following items:

- a) Payment for the Proceedings of the Microscience Conference, that were sent to members by George Marx as bonus for 1985 membership
- b) Support to the Organizing Committee of the GIREP Conference "COSMOS - An Educational Challenge"
- c) Shipment of the COSMOS Proceedings to members for 1986 membership.

The funds of GIREP are kept in three Banks:

- A) Barclay's Bank (London)
- B) Credit Suisse (Lausanne)
- C) Banca Popolare dell'Emilia (Modena).

<u>A) Barclay's Bank (£st)</u>	CREDIT	DEBIT
from 6 May 1986 to 30 May 1987		
1. Carried forward from previous balance	462.04	
2. Fees	737.25	
3. Interests	5.80	
4. Microscience Proceedings		130.00
5. COSMOS Conference (final balance)		60.66
6. Shipment of COSMOS Proceedings		777.40
7. Secretarial Expenses		52.50
8. Bank Charges & non-payment cheques		37.75
	-----	
Totals	1205.09	1058.31
<u>Carried forward</u>		<u>£st. 146.78</u>

<u>B) Credit Suisse (SFr)</u>	CREDIT	DEBIT
from 6 May 1986 to 30 May 1987		
1. Carried forward from previous balance	2455.95	
2. Fees	583.11	
3. Microscience Proceedings		1344.20
4. COSMOS Conference		1300.00
5. Bank Charges		108.11
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Totals	3039.06	2752.31
<u>Carried forward</u>		<u>SFr. 286.75</u>

<u>C) Banca Popolare dell'Emilia (Lit)</u>	CREDIT	DEBIT
from 6 May 1986 to 28 February 1987		
1. Carried forward from previous balance	916972	
2. Fees	714100	
3. Interests	58248	
4. Microscience Proceedings		474647
5. Newsletters n.15 & n.16		330200
6. Secretary's Expenses		84400
7. Bank Charges		68571
	-----	
Totals	1689320	957818
<u>Carried forward</u>		<u>Lit. 731502</u>

#### Sterling Summary

England:	approx.	150
Switzerland: SFr. 286.75 ----->	approx.	110
Italy: Lit. 731502 ----->	approx.	500
Hungary:	approx.	30
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<u>Total Sterling Equivalent</u>	<u>approx.</u>	<u>790</u>
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3. TEACHING MODERN PHYSICS - CONDENSED MATTER Munchen (West Germany), 12-16 September 1988

The Conference is organised by ICPE and co-sponsored by GIREP, whose President Paul Black and Vice-President George Marx are in the Consultative Program Committee.

The Conference's aim is to bring together experts from research areas and experts in teaching, in order to exchange information and start the production of new teaching materials on the rapidly developing field of "Condensed Matter". The site of the Conference - the University of Munchen - was specially chosen because it is where Max von Laue discovered X-ray diffraction patterns 75 years ago.

The main work of the Conference will be done in small Working Groups to be formed according to the experience and interests of the participants. Plenary lectures and evening lectures by outstanding research physicists will provide background information on recent developments. Poster sessions will provide an opportunity for the participants to present results from their own experience.

The plenary lectures and the Working-Groups will focus on three thematic subsections:

A) Structure; B) Materials Science; C) Electronic Properties.

The Working-Groups will be led by appointed persons and are expected to discuss experiences, needs, questions and possibilities of their subjects, channeling this work towards a development of new materials and suggestions for teaching.

GIREP members who intend to participate must please notice that their Application Form must be received in Munchen before 1st February 1988. As participation is limited to about 150, accepted participants will be sent a "letter of acceptance" that will inform them of further procedures (methods of payment etc).

4. PROCEEDINGS OF THE MUNCHEN CONFERENCE

-Each participant will get one copy of the Proceedings, the price of which is included in the participation fee.

- Each GIREP member not attending the Conference may get a copy, provided it is ordered in due time. The price will be calculated to just cover the costs of production. A rough estimation of the price will be available about mid-1988 - hopefully in time for the next Newsletter. The deadline for placing orders is END OF SEPTEMBER 1988. Please place your orders with the GIREP Secretary, whose address is reported in the last page of the Newsletter.

- Non-GIREP members, e.g. libraries etc, may also order copies, but they will have to pay a (modestly) higher price and it may be impossible to fulfil the orders if they are placed after the above mentioned deadline.

## 5. SUBSIDY FOR GIREP PARTICIPANTS TO THE MUNICH CONFERENCE

Financial help will be available for a limited number of GIREP members who intend to participate to the Condensed Matter Conference. Those members who wish to apply for support should please write to Prof. George Marx, whose address is reported in the last page of this newsletter.

A couple of Contact Members explored the possibility of obtaining financial support for school-teacher participants in their countries. Here are the findings for Denmark, Spain and Italy.

In Denmark, August Ziggelaar reports, normally the municipality or the State will not pay subsidies to teachers, but teachers can apply for subsidy to private funds.

In Spain, Daniel Gil-Perez says, the "Ministerio de Educacion y Ciencia" and the correspondent Autonomous Authorities do give financial aid to school-teachers attending International Conferences.

In Italy, the GIREP Secretary was informed that financial aid would be granted to participant teachers by the "Ministero della Pubblica Istruzione, Direzione Generale Scambi Culturali".

## 6. REPORTS ON INTERNATIONAL EVENTS

Summer School on "New Concepts in Physics Teaching" from Zofia Golab-Meyer, Jagellonian Univ., Reymonta 4, 30-059 Krakow, Poland

The Summer School was held in Zakopane (Poland), from 24 to 30 May 1987. 50 people participated, 20 from abroad. Parallel to the Workshop for teachers, the IXth Little Summer School for highschool pupils was held. The topics of the two schools were:

For the teachers:

- Concepts of a unified description of nature.
- Energy in a physics curriculum for beginners.
- Mechanics in terms of momentum currents.
- Entropy right from the beginning.
- Data processing and transmission.
- Modelling of physical processes on microcomputers.
- Introductory experiments to statistical thermodynamics.
- Demonstration of the Bielousov-Zhabotinski reactor.
- Model experiments.
- Science education in the past and new trends in science education.
- Seminars and activities with pupils.

For the pupils:

- Introductions to: Statistical Physics and Laser Physics.
- Introduction to phenomenological thermodynamics.
- Deterministic Chaos.
- Bielousov-Zhabotinski Experiment.
- The integral of motion: Chaos in a conservative system and solitons.

Time and Thermodynamics.  
Computers and applications.  
Problems of contemporary physics.  
Seminars on Turbulence, Lasers and Dirac's Hypothesis.

Provided she finds adequate financial support, Prof. Golab-Meyer hopes to be able to organize a similar workshop in 1988, devoted mainly to teaching chaos and non-linear phenomena.

2nd International Seminar - Misconceptions and Educational Strategies in Science and Mathematics - Cornell Univ., USA, 26-29 July 1987 by Michela Mayer, CEDE, Villa Falconieri, Frascati, Italy

8 parallel sessions, 175 papers and more than 250 participants from all over the world prove the widespread interest for this field of research in science education.

Two points seem to receive general agreement:

1) The impact of the students' previous knowledge, experience, patterns and schemes of reasoning, all of which are currently used in everyday life, on any learning process

2) The implementation of educational strategies through which students can explicitate and criticize their previous knowledge, as a premise to conceptual change.

References in this field of research go therefore not so much to Piaget as to Ausubel and Kelly and the psychological setting is a cognitivist or constructivist one. But behind this general agreement on the fundamentals lie largely different points of view. Many researchers, for example, do not agree with the term "misconception" used in the title of the Seminar. They prefer to speak of pre-conceptions or of alternative patterns of reasoning or of common-sense knowledge or of childrens' science. The different wording underlines the different importance given by researchers to "common knowledge" vs "scientific knowledge".

In comparison with other Conferences on the same subject we are struck by the increase in the number of papers dealing with conceptualization in Mathematics - 35, lower than Physics (48 papers) but higher than all the other sciences put together. 35 papers dealt with psychopedagogical themes and discussed a variety of educational methods and strategies: concept mapping, taxonomies, hierarchies, problem solving techniques through which teachers may help students to explicitate their schemes of reasoning in order to induce conflicts and changes.

The participants can broadly be divided into two large groups or "schools": english-speaking researchers mostly seem to address their work towards educational strategies and psychopedagogical generalizations, while the interests of the other group (that we may call "european" but includes some latin-american researchers too) seem to be more specifically directed towards the single sciences, not only in relation with education but also using conceptual research as a means for exploring the sciences from an epistemological point of view.

With a few exceptions these approaches reflect differences in the researchers' background, in the way teachers are prepared and in the school curricula in the researchers' countries. In english-speaking countries where teachers and researchers usually are "science educators" with a bachelor degree in science and a master or a Ph.D in education, attention is paid to educational issues rather than to the structure of the single sciences. On the other hand, the theoretical foundations of european and latin-american researchers usually are sounder in the sciences and their psychopedagogical knowledge less formal, so their interests are devolved more to philosophical and epistemological aspects.

In UK, Canada and the USA mixed groups - researchers & teachers - are trying out special strategies and curricula. Driver's group at the University of Leeds presented results on how teachers accept and implement a new and partly published curriculum that emphasizes the importance of pupils expressing and personally restructuring their ideas. The work of Erickson's group at Vancouver is more centered on teaching methods and the teachers' role and on techniques for exploring the students' ideas. Novak and Gowin (Cornell) showed that conceptual mapping or "Gowin's V" promise to be useful instruments not only in learning but also for assessment of learning.

Other papers dealt with school-teachers' conceptions. The Hewsons (Univ. of Wisconsin), for example, use the "interview-about-instances" technique to find out what teachers mean by "teaching science correctly".

From the viewpoint of epistemology Nussbaum (Jerusalem) found that a mechanistic and reductionist approach to biology is quite common among biology students and biologists, also at a fairly high level of competence. Jung (Frankfurt) compares the intellectual changes brought by mastering a scientific subject with those needed to absorb a different culture and refers to a particular case in optics. Karrqvist and Renstrom (Goteborg) suggest new educational aims and strategies after their study of the students' spontaneous ways of conceptualizing two topics: electric circuits and properties of matter.

In Italy the work of Mayer (CEDE) shows the importance of language and of everyday experience in concept building, but also the ambiguity, from the viewpoint of common sense, of many of the statements found in textbooks. On the other hand, the history of science shows that alternative statements are often consistent and that alternative paths may also lead to the correct scientific results.

Fuchs (Winterthur) suggests a learning strategy based on these alternative conceptions.

Practical suggestions for classroom activities are not often put forth by european researchers. We can mention the work of Tomasini and Pecori (Bologna) and of Caravita and Tonucci (Rome).

Finally, Schmidt (Dortmund) argues that the ideas of students usually are smart alternatives to scientific theories. As such,

not only how the students construct them, but also what their relationship to scientific theory is, deserve to be explored.

Those interested in the Seminar Proceedings may contact Prof. J. D. Novak, Dept. of Education, Roberts Hall, Cornell University, Ithaca, N.Y. 14853, USA.

## 7. BOOKS

Experiments and Activities on the three Laws of Dynamics (170 pages)

This book, published by ICASE, commemorates the 300th anniversary of Newton's "Philosophiae Naturalis Principia Mathematica". It comprises a series of laboratory and home experiments illustrating the three laws of dynamics. The book is intended as a teacher resource, essentially for teachers at the secondary level. The material has been collected together from a variety of old journals, books and laboratory manuals of curriculum projects. Much of the material is not too well known, but all the activities are meaningful from a didactic and physics point of view.

Copies of the book may be obtained from member associations of ICASE or from the ICASE Treasurer, Knapp Hill, South Harting, Petersfield, GU31 5LR, UK. The price is Lst. 4.00 (\$ US 6.00) plus postage and packing at 25%.

## Past Proceedings

Proceedings of past Balaton Conferences are available at a very low price in Hungary. Those interested please contact George Marx, whose address is reported in the last page of this Newsletter.

## 9. HISTORY OF PHYSICS

Two Conferences on history of Physics took place in Pavia (Italy) in September 1984 and in September 1987, organized by prof. Fabio Bevilacqua. Following these Conferences, the Advisory Committee for Physics Education of the European Physical Society decided to found a European Group for History of Physics. A preliminary meeting took place in Paris in November.

If you are interested, please contact prof. J. Depireux, Institut de Physique B-5, B-4000 Sart-Tilman, Liege 1, Belgium.

## 10. FORTHCOMING CONFERENCES

Trends in Physics Education - International Seminar on trends and open problems in physics education. Smolenice (Bratislava), Czechoslovakia, 28 March - 1 April 1988.



Organizers:

- \* Union of Slovak Mathematicians and Physicists
- \* Mathematics and Physics Faculty of the Comenius University
- \* Institute of Physics of the Slovak Academy of Science
- \* Electrotechnical Faculty of the Slovak Technical University
- \* Advisory Committee for Physics Education of the European Physical Society.

Main topics:

- \* Education of Physics teachers
- \* Can we stimulate in our students the abilities of problem solving and of independent "physical" thinking?

Accommodation and expenses:

The participants will be accommodated in the castle of Smolenice. Those wishing to stay in Bratislava before or after the Seminar please inform the organizing Committee.

Total expenses including also the Conference fee are expected to be about \$ US 100. For local participants and for participants from Eastern European countries the amount will be about 800 Czechoslovak Crowns.

Participation is limited to about 80 people.

Application: There will be no application form. In case you wish to participate please send the organizing Committee the following information: name, mailing address, date and place of birth, passport number and the title of the contribution you wish to present.

Contact: Jan Pisut, Dept of Theoretical Physics, Comenius University, 842 15 Bratislava - Mlynska Dolina, Czechoslovakia.

Science Education and the Quality of Life: a World Issue, Canberra, Australia, 3-9 July 1988 - Organized by ICASE (Int. Council of Associations for Science Education) and hosted by ASTA (Australian Science Teachers' Association)

Program Today our society supports people who can model black holes in space, inscribe their signatures on our genes, or make weapons capable of destroying everyone on earth. We live in an era of unprecedented advances in science and technology. New industries and new products are making a profound impact upon our lives - but many are uneasy about the fruits of this effort. The theme of the Conference is of great importance to us all - at individual, national and international levels. What is our role as teachers and educators? How can science programs in primary, secondary and tertiary classrooms relate and respond to issues which affect the quality of our lives? A broad and diverse program will focus on four areas.

- \* Scientific and technological developments and their impact upon our lives
- \* Science education and its contributions - past, present and future, to the quality of life
- \* New approaches in science education related to the education of girls and boys, the education of teachers and the education of the

wider community

\* Science curriculum trends and issues.

Contact: ICASE World Conference Secretariat, P.O.Box E345, Queen Victoria Terrace, Canberra ACT 2600, Australia,

International Astronomical Union Colloquium on the Teaching of Astronomy: Past and Future Williamstown, Massachusetts, USA - 27-30 July, 1988

Contact: J.R. Percy, Univ. of Toronto, Toronto, Ontario, Canada M5S 1A1.

ATEE Conference, Barcelona (Spain), September 1988

The Group Activities of the Conference will be dedicated to a theme called "Learning problems and Teaching Strategies in Science Education". A small pre-congress symposium might also be organized. Possible research questions are:

- \* Which preconceptions/misconceptions on science subjects are manifest in pupils?
- \* Which teaching strategies can be used that take into account preconceptions/misconceptions of pupils?
- \* Which preconceptions/misconceptions on science subjects are manifest in student-teachers?
- \* Which teaching strategies can be used to take into account preconceptions/misconceptions of student-teachers?
- \* Which skills and attitudes are manifest in student-teachers on the subject of bridging the gap between the conceptions of pupils and the conceptions of the discipline?
- \* How to make use of such skills and attitudes in teacher training?

A preliminary meeting to be held in February or March at the free University of Amsterdam will deal with:

- \* Investigation of common research goals in different countries
- \* Extrapolation of future possibilities for cooperation in common fields of interest
- \* Planning of some common research in different countries, the preliminary results of which should be reported in the Barcelona Conference.

Contacts: Dr. F. G. Brinkman, Dept of Educational Research, Hogeschool Holland, Postbus 261, 1110 AG Diemen, The Netherlands. Prof. J. Depireux, Institut de Physique B-5, B-4000 Sart-Tilman, Liege 1, Belgium, telex UNIVLG 41397

## 11. CAN FLOW-CHARTING TECHNIQUES AID PHYSICS TEACHING? by Silvia Pugliese Jona

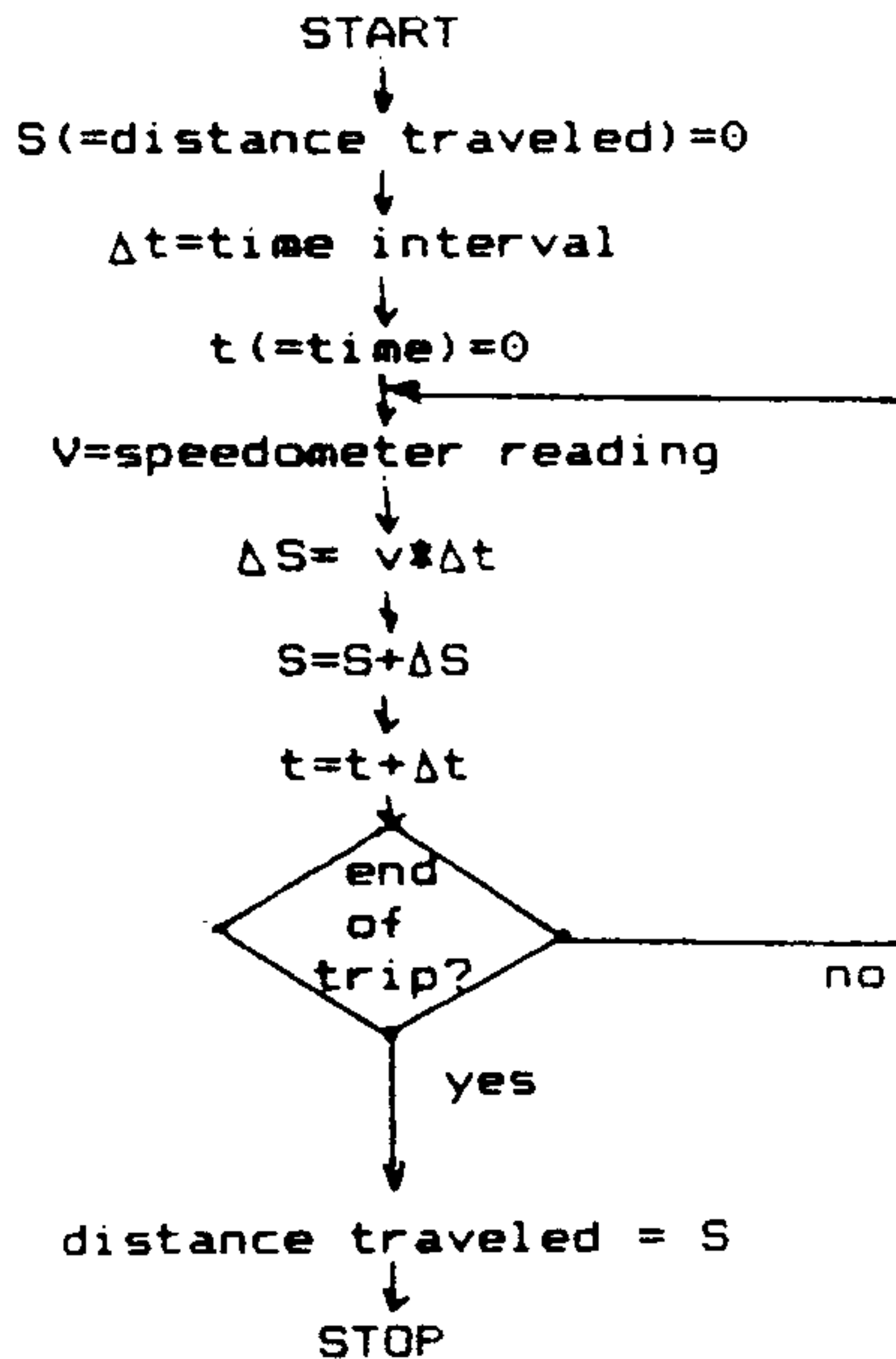
In the context of a national project to introduce and use informatics in the teaching of physics and mathematics in the Italian high-schools, I'm attempting to apply the communication properties of flow-charting to physics teaching with my 14-year old pupils.

Here is an example:

Aim - to introduce the properties of velocity vs time diagrams in kinematics.

Method - the class is set the following problem: How would you calculate the distance traveled in the desert if the distance meter of your car is broken but your speedometer is still working?

The problem is worked out collectively and gives rise to the following flow chart:



After writing the flow-chart the pupils use it as mentor to calculate the value of S in two simple cases:

- 1) motion with constant velocity and
- 2) motion with constant acceleration

and find out that in the second case the distance traveled depends on  $\Delta t$ . Graphing the velocity and interpreting the meaning of their calculations on the graph leads to the concept of distance traveled being represented by area.

As an optional, pupils may write a short program and check the results with a computer.

Your GIREP Secretary would be happy to exchange experiences and ideas with anyone who is working in the same direction. Thank you!

If you wish to use the GIREP Newsletter as a means of exchange of the above kind, please write me your request and contribution.

Silvia Pugliese Jona

## GENERAL INFORMATION

### GIREP COMMITTEE

President Paul Black, Centre for Educational Studies, King's College London (KOC), 552 King's Rd, London SW10 0UA, UK (tel 01/3512488)

Vice-presidents George Marx, Dept Atomic Phys., R.Eotvos Univ., Puskin u. 5, PB 327, 1088 Budapest, Hungary (telex 225459, tel 361/131843)

Piet Lijnse, Rijksuniversiteit, 3508 TA Utrecht, pob 80008, The Netherlands (tel 09/3130531179)

Secretary Silvia Pugliese Jona, via San Nazario 22, 10015 Ivrea (Torino), Italy (tel 0125/49869)

Treasurer Brian Davies, The Institute of Physics, 47 Belgrave Sq, London SW1X 8QX, UK (telex 918453, tel 01/2356111)

### FEES

The yearly fee for 1988 is equivalent to £st 10.00 at the rate of exchange current at the date of application for membership or renewal of membership. The sender must pay his or her own bank charges and mailing costs. There are four possible methods of payment:

1) Fees from Italy must be paid in Italian Lire to Marisa Michelini, Istituto di Fisica dell'Università, via Campi 213/A, 41100 MODENA.

2) Fees from countries other than Italy may be paid in £st, made out to "GIREP account 90301248" and sent to Brian Davies, address at top of page. This is the preferred method of payment.

3) Fees from countries other than Italy or Great Britain may also be paid in Sw.Fr, preferably through bank and not by cheque, to "GIREP account 376089-91", Credit Suisse, 1002 Lausanne, CH.

4) Fees from countries where the above procedures are very difficult or impossible may be paid directly to George Marx after having agreed on a procedure with him (address at top of page).

Please note: The accounting year runs from January to January but if application forms and fees arrive after the month of September membership will - unless the applicant specifies otherwise - become effective at the beginning of the following year.

### APPLICATIONS & NEW MEMBERS

Applicants for membership should please require the application form from the Treasurer.

### INQUIRIES - CHANGES OF ADDRESS

Please address inquiries concerning fees to the Treasurer.

Other inquiries may be addressed to the Secretary or to any other member of the Committee.

Please send notice of changes of address to the Secretary.

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