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September 7, 1977

Mr. Peter Slade
Department of Chemistry
45600 Airport Road
Chilliwack, B.C. V2P 6T4

Dear Peter:

Enclosed are a number of different items for inclusion in the Newsletter. I have not proceeded as far as I hoped with the conference reports but instead I thought that the idea might be expanded into a regular column which I would be prepared to organise for each Newsletter. Hopefully, other members will be encouraged to send in first-hand reports but if they do not, I have plenty of material to keep it going and can get more from published abstracts if necessary.

In addition to the articles I have prepared there are a few other items which should be included. I hope Jans or Geoff have prepared a summary of the committee meeting at Montreal but if not, some mention of the main points should be included - I have mentioned the proceedings. There are a number of conferences of interest coming up in the new year which should be included in the coming events:

1. Canadian Institute of Chemistry
   Winnipeg, Manitoba June 4 - 7, 1978
   Chemical Education Program Chairman, Hymie Gesser
   Department of Chemistry, University of Manitoba,
   Winnipeg, Manitoba R3T 2N2

2. 5th Biennial Conference on Chemical Education
   Fort Collins, Colorado July 23-27, 1978
   Information: J.J. Lagowski, Department of Chemistry,
   University of Texas, Austin, TX 78712

3. Chem Ed 78, Philadelphia, Pennsylvania.
   August 21-25, 1978.
   Information: Andrew Breyer, Beaver College,
   Glenside, Pa. 19038

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4. New Directions in the Chemistry Curriculum
An International Conference on Introductory Chemistry
McMaster University, Hamilton, Ontario.
June 19-23, 1978

I would be very much in favour of dropping the emphasis currently given to "Newsletter" in the label for the publication and replacing it with "COLLEGE CHEMISTRY." (Official publication of College Chemistry Canada). As we are including a number of original papers, I think there also should be an official disclaimer of the "Views expressed are not necessarily those of the Editor of C_3" etc.) just in case someone takes exception to being misquoted.

Two other points: We should claim copyright on each issue - maybe it is possible to obtain a blanket copyright on this type of publication. I would be worried about a contributor submitting an article in good faith only to see it reproduced in some other more auspicious journal under another name or in his own name without permission. The second point is that I think we should send complimentary copies of the Newsletter to Reg Friesen (Editor Chem 13 News) and to the Chairman of the C.I.C. Chemical Education Division (Ron Gillespie this year).

I hope this all arrives in time.

Sincerely,

Graeme

Graeme Welch, Ph.D.
Department of Chemistry

gw/mkc

CONTROVERSIAL OPINION

The present-day chemistry student often appears to have great difficulty in recalling (or even learning) the immensity of factual information required in a modern chemistry course and the failure of students to adequately assimilate knowledge of the chemical properties of the elements is a common complaint at any meeting of chemistry teachers. Students cannot remember the chemical formulae; they are unable to categorise even the simplest binary compound ("AgCl is a green gas"); distinguish between a weak acid and a strong base; and so on. It would be easy to place the blame on the students alone, their lack of motivation, their unfamiliarity with the discipline of rote learning or the level of their intellectual skills, but a realistic look at the syllabus of an introductory chemistry course may be a better starting point.

The emphasis given to chemical principles and theory provides very little opportunity for the constant practice and continual reinforcement that is necessary for a student to become fluent in the chemical language. All too often there is insufficient space available in the crowded curriculum for more than a few isolated examples to illustrate a principle or concept which itself was derived from countless practical experiments and observations. Unfortunately, an involved description of core electron shielding effects followed by a brief demonstration of sodium being dropped into water provides little assistance to a student struggling to remember the formula of cesium fluoride (or is it caesium flouride)?

The nature of the dilemna is clear but the solution is far from obvious. The student is unable to learn the facts without the support of the theory which relates them, yet the theory is an empty shell without a sound knowledge of the observations from which it is derived. Chemistry teachers have adopted a curriculum based on the latter case. Implied in this approach is the assumption that students will be able to readily interpolate chemical properties from the theory, an assumption which present day students are soundly proving incorrect. The student is being

led to believe that the violent reaction of sodium with water occurs because of the core electron shielding effects. This is not true; the theory is a reasonable explanation of the known chemical observations - no more. If the student is having difficulty in making the transfer from the theory to the observation, it is little wonder that the formula of cesium fluoride fails to become familiar and meaningful.

A new approach to the general chemistry curriculum at the secondary and undergraduate level is needed, but the design of this curriculum must be soundly based upon an attempt to achieve a balance between theory and observation appropriate to the cognitive level of the student. This will not be accomplished by simply juggling with topics in the syllabus.

There is a move at present toward re-introducing more so-called "descriptive" chemistry into the syllabus, thus reversing the trend toward physical theory which began with the "sputnik" era and the curriculum revisions of the early 1960's (CHEMSTUDY, CBA, etc.). Undoubtedly certain topics, notably quantum mechanics, could profitably be dropped from the High School and College curriculum but there will be no gain if they are simply replaced with something else equally inappropriate.

A completely new curriculum approach based on the "descriptive" chemistry of the elements, industrial processes and environmental chemistry has been proposed by some teachers. At first sight, this may seem an attractive idea. It has the attributes of relevance and perhaps the emphasis on descriptive chemistry will help students to remember the formulae of ionic compounds; but there is a great danger of swinging the pendulum too far in the opposite direction. There is no more evidence that filling students' heads with a vast compendium of chemical facts and applications will make them any better prepared for their eventual careers than will a collection of empty theories. The chemistry student of the 1920's and 1930's did not learn descriptive chemistry by rote memory from choice but because the principles or the means of expressing these principles was not always available

led to believe that the violent reaction of sodium with water occurs because of the core electron shielding effects. This is not true; the theory is a reasonable explanation of the known chemical observations - no more. If the student is having difficulty in making the transfer from the theory to the observation, it is little wonder that the formula of cesium fluoride fails to become familiar and meaningful.

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to place the experimental observations into a meaningful perspective.

The physical theories of atomic structure, bonding, energetics, thermodynamics, equilibria, molecular kinetics, etc., have become irrevocably woven into the fabric of chemistry. They cannot be dropped from the curriculum and replaced with the factual information from which they were derived in the first place. It is not necessary to provide explicit and sophisticated explanations of this type of principle at the introductory level. It is essential to present chemical phenomena to the students in a context which will both prepare them for the more abstract theory at higher levels of education and yet still be self-consistent and useful to those students who choose not to continue their studies past high school or the first year of college. Students who have not reached the formal level of thinking are still capable of extending, subdividing and ~~continuing~~ combining information into new relationships. Chemical knowledge must be presented at the introductory level in such a manner as to take advantage of this ability to provide a sound foundation for the more sophisticated abstract theory which the student may encounter later. In addition, the more able student must not be prevented from receiving the stimulus and excitement of extending his observations and factual knowledge into a full understanding of the underlying principles.

The chemistry curriculum is in need of substantial revision at both the secondary and undergraduate level. This will not be successfully accomplished by dropping chemical theory and adding descriptive chemistry. The new revision must begin with not WHAT the students learn but HOW they learn.

* * * * New Directions in the Chemistry Curriculum. An International Conference on Introductory Chemistry. McMaster University, Hamilton, Ontario, Canada. June 19th to 23rd, 1978. A conference on the content of high school and introductory college and university chemistry courses, whose goal is to develop an outline of a new

curriculum which places a greater and more appropriate emphasis on descriptive chemistry.

A maximum of 120 participants will be accepted for the conference and applications must be made by December 12, 1977. At the present time, there are no college teachers listed as organizers for the conference. Apply early.

For information write:

The Instructional Development Centre
McMaster University
Hamilton, Ontario L8S 4M1