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DEVELOPMENT OF EDUCATION AND CONTINUING PROFESSIONAL DEVELOPMENT STRATEGY

[Presented to the Institute of Actuaries, 24 March 1997,
and to the Faculty of Actuaries, 21 April 1997]

SUMMARY

This report outlines proposals for the development of the Education and CPD strategy of the profession.

The first part of the report gives an introduction to the key issues which have been considered in developing the strategy. The main part of the report describes the proposed model and the rationale behind various aspects of the proposed model. In particular, there is a commentary on how key issues have been addressed.

The report has been discussed at a joint meeting of both Councils, and has received support for further development along the broad lines indicated. The key emphasis is on evolution from our present strategy. The report is now being issued for wider discussion by the profession.

Comments are particularly sought on the following issues:

(1) Is it necessary to specifically assess detailed country-specific legislation and regulation in any subject prior to Fellowship, or is it appropriate to assess this at Stage 3 through the problem solving activity as proposed in the paper?
(2) How useful will it be to members to seek intermediate qualifications from the Privy Council ?
(3) Should the profession look to increasing the range of assessment methods used?
(4) The Fellowship qualification is defined as the level of an embryo actuary. How do we encourage actuaries to gain enhanced skills during the CPD stage?
(5) Is the approach to specialisation appropriate?

PART I

DEVELOPMENT OF EDUCATION AND CPD STRATEGY

1. INTRODUCTION

1.1 The Education and CPD Board has been conducting a strategic review of the profession's education process, with the aim of ensuring that it will meet the changing needs of the profession into the next century.

1.2 The current structure for the joint examinations leading to Fellowship of the Faculty or Institute was introduced for examinations in 1994. In 1992 both Councils adopted a Continuing Professional Development (CPD) Scheme. This

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report concentrates primarily on the evolution of the education leading to the Fellowship qualification. However, some aspects reflect possible changes and developments in the post-qualification stage of actuarial education.

1.3 The decision to undertake a review of current strategy was made in the autumn of 1995. The following factors were important in reaching this decision:

— publication of the report on The Future of the Profession commissioned by Councils;
— continued concern over pass rates in the examinations;
— concerns from some Practice Boards about the current syllabuses;
— investigation into a core syllabus for basic actuarial training in the Groupe Consultatif;
— the decision to look into a core syllabus for basic actuarial training throughout the world through the International Forum of Actuarial Associations (IFAA); and
— developments in actuarial education in Australia and the United States of America.

2. BACKGROUND CONSIDERATIONS

A number of issues were considered as background to the debate.

2.1 *Skills Required by an Actuary*

There is general acceptance that to be successful an actuary needs:

— technical actuarial skills;
— professional skills; and
— non-technical skills.

In the current examinations for qualification the main emphasis is on technical actuarial skills, with one paper dealing with communications skills. The profession does not assess directly the acquisition of non-technical skills.

The Future of the Profession report suggested some skills that might be considered for inclusion. Similarly, the Institute of Actuaries in Australia and the Society of Actuaries have considered some skills for inclusion, in future, in their syllabuses. These reports were considered in formulating these proposals.

2.2 *Levels of Qualifications*

Currently the actuarial profession is perceived, both internally and externally, as having difficult examinations. There is no intermediate qualification for students who do not complete all the examinations. In addition, *The Future of the Profession* report questions whether we have appropriate qualifications for the actuary of the future.

The issues to be addressed are:

— At what level should Fellowship be? This is, presumably, the minimum qualification needed to practise as an actuary. However, it is not expected

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that a newly qualified actuary will be fully equipped to carry out all actuarial functions in any specialism. These enhanced skills would be learnt through CPD.

— Should there be a lower-level qualification for an actuarial technician? There could be Privy Council objections.

— Should there be a higher-level qualification or qualifications?

2.3 *Maintenance of Standards*

The ECPD Board is committed to the maintenance of standards. However, the skills required to be a newly qualified actuary change over the years. Thus, a new FFA now will have been assessed in general insurance and communications, whereas a new FFA two years ago would not. Standards expressed in terms of potential to carry out actuarial functions may not have changed, but the actual knowledge base has changed. Yet, over time, the range and scope of actuarial functions and duties change to some extent. Standards are about expectations — the profession's expectations of its members who gain a qualification — not about knowledge gained.

2.4 *Specialisation*

Under the current United Kingdom education model an actuarial student may be working from the start in only one specialist area, e.g., pensions consultancy, but is required to pass examinations in other areas such as general insurance. Once qualified, CPD is likely to be in one area only, e.g. pensions, so specialisation is, in effect, recognised at this stage.

A key issue is at what stage should specialisation be acknowledged.

2.5 *Place of Current U.K.-Specific Legislation and Regulation*

The development of actuarial principles cannot be done in a completely theoretical context, and some contextual considerations are necessary. However, it is clearly evident that, if too much detail is given and required for assessment, the underlying principles can be obscured. Additionally, details of current legislation and regulation are more susceptible to change, and need to be regularly updated.

There has been considerable debate on whether details of U.K. legislation and practice should be studied and assessed specifically prior to qualification, or deferred to the CPD stage.

2.6 *Practical versus Theoretical Emphasis*

Many countries have chosen a more university-based approach to pre-qualifying education than the U.K. has. Such an approach can mean that students gain little experience of practical approaches to problems. In some professions this is resolved by a period of articles, but the U.K. actuarial profession has not taken this route.

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The Board believes that the U.K. profession would wish to maintain a balance between theory and practice in its education.

2.7 *Entry Qualifications*

The point of entry into actuarial education is an important consideration. The U.K. actuarial profession requires, formally, a level of ability in mathematics.

2.8 *Syllabus Balance between Historical, Current and Future Techniques*

The syllabus content has to strike a balance between what is required for current practice, what is likely to be required for future practice, and what is required to provide an understanding of how actuarial thought has developed over time. The U.K. profession can adjust its syllabuses through the process of regular review. However, too much attention to future techniques can lead to volatility, while too much attention to the past and even the present can lead to stagnation.

2.9 *Links to Other Professions*

Actuaries need to have some awareness of other disciplines, e.g. law, accountancy, financial economics. Again, balance has to be considered.

2.10 *Assessment Methods*

A key consideration is whether the current assessment methods are appropriate for the skills to be tested. The actuarial profession has used unseen time-constrained examinations historically, but other methods might be appropriate for some parts of the assessment.

2.11 *Quality Assurance*

While developing a new strategy, it is important that consideration is given to all aspects of quality assurance of the process — examinations, tuition, student recruitment and support. The education process will only be successful if:

— students entering the process are fully aware of the objectives to be achieved;
— tutors prepare students in the right way;
— examiners examine in line with the objectives;
— employers offer students appropriate support; and
— communications are good, to ensure that all are working to a common goal.

2.12 *Evolution not Revolution*

The U.K. actuarial profession changed its education strategy in 1994, and is currently developing its CPD strategy. The Education and CPD arena is increasingly seen as a continuum. The future strategy should be seen as a development of the present strategy, not as a radical change of direction. There is a firm commitment to evolution rather than revolution. Information on transitional arrangements will be published as the details are worked out. However, students

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who have already completed the current Foundation Stage — Subjects A-D, will not be required to take any of the new modules in the first stage.

PART II

PROPOSED MODEL FOR DEVELOPMENT OF EDUCATION AND CPD STRATEGY

3. This part of the report contains a possible structure for the future qualification and further training process through CPD for the U.K. actuarial profession. The ideas expressed here have developed as a result of a number of debates within the ECPD Board and its committees, and were presented to Councils at a joint meeting in September 1996.

4. PROPOSED STRUCTURE

Stage 0 *Entry Requirements*

These will remain unchanged.

Stage 1 *Foundation Stage*

The following objectives for the evolution of the early subjects have been proposed:

— to strengthen the mathematical/statistical basis of the foundation subjects;
— to broaden the applicability of the foundation subjects;
— to provide access to financial economics;
— to help the actuary communicate with statisticians and financial economists;
— to place more emphasis on the role of models as links between data and applications;
— to introduce the use of models as an aid to judgement;
— to help actuaries understand relevant data; and
— to ensure that university exemptions are still available.

The early subjects will be presented as an evolution of the current subjects A-D. Nine separate themes are proposed, covering the material indicated below:

1. *Statistical Modelling*
Probability
Statistical distributions
Statistical models
Data analysis
Regression
Hypothesis testing
Estimation.

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2. *Financial Mathematics*
Introduction to asset types and securities markets
Interest and discount
Force of interest
Investment risk, stochastic interest and discount
Market models.

3. *Economics*
The scope of economics
Supply and demand and equilibrium price
Effect of controls on prices or supply
Elasticity of demand and supply
Utility theory and consumer choice
Analysis of insurance problems in terms of utility
Market structures
General equilibrium theory
The theory of the firm
Public sector finance and taxation
National income measures
The circular flow of income
The multiplier and accelerator
Aggregate demand and supply
Government fiscal policy and its effects
Government monetary policy and its effects
The money supply and credit creation by the banking system
The major factors affecting:
(1) unemployment;
(2) inflation; and
(3) economic growth;

Monetarist and Keynesian approaches
International trade, exchange rates and the balance of payments.

4. *Finance and Financial Reporting*
Company structure and financing
Basic principles of taxation:
(1) personal; and
(2) corporate;

Principles of taxation of investments held by individuals
Principles of taxation of investments held by institutions
The role of the main institutions in financial markets
Basic structure of company accounts:
(1) profit and loss (revenue) account;

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(2) balance sheet; and
(3) cash flow statement;

Basic principles of group accounts
Calculation and use of accounting ratios
Limitations of company accounts.

5. *Stochastic Processes*
Probability spaces
Discrete time stochastic processes
Martingales
Stopping times
Markov processes
Brownian motion
Stochastic differential equations.

6. *Risk Mathematics*
Risk models
Loss distributions
Credibility theory
Ruin theory
Run-off triangles and NCD.

7. *Survival Models*
Specification of survival/transition models
Estimation of complete and incomplete lifetimes
Numerical methods for multiple state models
Comparison of experiences
Graduation (less than at present)
Application to assurance contracts
Application to annuity contracts
Application to PHI contracts
Future loss, principles of premiums and reserves.

8. *Life Insurance and Pensions Mathematics*
Principles of with-profits business
Principles of unit-linked business
Principles of pension funds
The profit test
Pricing
Reserving
The control cycle
Pension fund mathematics

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Computer applications, simulation
Guarantees and options.

9. *Financial Economics*
Derivative securities
Arbitrage-free principles
Black-Scholes model
Hedging and immunisation
Term structure of interest rates.

The material in the themes 1-4, 6-8 is similar to that covered already, or planned, for the current units A-D, although there will be some change in emphasis to support the proposed objectives. The material in theme 5 provides the necessary foundations for a broader range of models to be covered. Theme 9 covers material on financial economics, which is, at present, planned for inclusion in Subject E. It is felt that it would be sensible to expand the Foundation Stage under the new strategy, and to leave the Applications Stage with reasonably balanced subjects.

Assessment will be by unseen examination papers, each of 2-3 hours.

A Dip Act Tech could be awarded after the successful completion of this stage.

Stage 2 *Application Stage*

The following objectives have been proposed:

— to consider the principles of actuarial planning and control;
— to consider practical applications of core actuarial techniques;
— to help actuarial students develop an understanding of the nature and assessment of risk;
— to explore developing applications of core actuarial techniques;
— to help actuarial students appreciate the interaction between the development of actuarial concepts and the cultural, regulatory and legal framework in which they are developed; and
— to emphasise the importance of communication in technical and non-technical aspects of an actuary's function.

Students will take five subjects at this stage.

Four application subjects E-H should remain as a framework for considering key application areas. These four subjects will retain the current titles:

10. *Investment and Asset Management*

11. *Life Insurance*

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12. *General Insurance*

13. *Pensions*

A key underlying theme will be the nature and assessment of risk. As part of this, each of the four subjects will be broadened to cover aspects of developing topics such as:

Medical insurance
Permanent health insurance (PHI)
Long-term care
Critical illness
Group benefits.

The emphasis in the four subjects will be on principles and their applications, rather than on detailed U.K. knowledge.

A number of themes will be developed to be covered in each of the application areas. Assessment of these subjects is likely to be by one three-hour paper on each subject. Each paper might contain a choice of questions to be answered, subject to appropriate constraints.

Examples of differences in approach taken in other countries will be used to illustrate the fundamental principles. The emphasis is thus on critical evaluation, understanding and problem solving within broad contexts, rather than on detailed knowledge.

The study for the four application subjects will be preceded by a short teaching module on the principles of the actuarial control cycle. It is intended that this will not be assessed separately, but will be assessed through the subject material.

During this stage students will also be required to demonstrate competence in communication and report writing. The fifth subject will thus be:

14. *Communications*

Assessment will be by one two-hour examination in communication to a non-actuarial audience, based on an actuarial concept from the Foundation Stage or on the actuarial control cycle. Communication of technical ideas will feature throughout the assessment of this stage. Consideration will be given to assessment in languages other than English.

Qualification leading to a category of membership might be awarded on completion of this stage.

Stage 3 *Fellowship*

The following objectives have been proposed:

— to develop higher order skills; and
— to introduce U.K. market practice and legislation in one practice area.

The Fellowship examination will consist of two separate assessments. Students will take the Fellowship in an area of their choice.

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Initially the Fellowship will be offered in: Investment, Life Insurance, General Insurance and Pensions. Further options could be added at a later stage.

The assessments will test the highest-order skills of analysis, synthesis, judgement and communication, within a U.K. context. The first assessment is likely to be an unseen examination with questions demanding problem solving skills within a U.K. context. Credit will be given for U.K.-specific knowledge of regulation and legislation. The second assessment will involve other methods, such as evaluating a seen case study or an open-book examination.

Alternative papers might be offered for students based in countries overseas. Thus, students might wish to take a Fellowship examination based on practice, legislation and taxation relevant to their own country.

Fellowship will be awarded on successful completion of this stage.

Stage 4 *Post-Qualification*

Actuaries will embark on their chosen programme of Continuing Professional Development (CPD).

A professionalism course will be taken at the latest in the first year post-qualification, but consideration could be given to including it earlier in the process.

Assessed certificates could be offered in developing areas of application or in established areas where particular topics are studied in depth. These will not diminish the importance of the Fellowship qualification, but be provided for actuaries who wish to enhance their knowledge in particular areas.

Fellows will be allowed to take any of the examinations leading to the Fellowship qualification as part of their programme of CPD if they have not studied the material at the time of qualification.

Actuaries should consider CPD in non-technical areas.

Actuaries wishing to change fields will be encouraged to take the first paper of the Fellowship in the relevant field. (This could be mandatory for those requiring a practising certificate).

5. Features of the Proposed Structure

5.1 *Skills Required by an Actuary*

The proposed model concentrates on the development of core actuarial skills, and keeps non-technical skills as an employment-based activity, to be acquired alongside, or following, the actuarial qualification. The emphasis in the first stage is on the acquisition of tools which have a wide range of applications. At the second stage it is proposed that students take examinations in four application areas. An alternative approach that was considered is to look at a number of themes relevant to the actuary's work in financial risk management. These themes would be illustrated by examples from a number of applications areas. However, on balance, the Board has concluded that it is preferable to start with a structured

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contextual basis for a few traditional applications areas, and consider the themes within this framework.

5.2 *Levels of Qualifications*

These might be Diplomate, Associate and Fellow.

Work will have to start soon with the Privy Council to determine whether levels of qualifications below Fellowship can be introduced with designatory letters. This work may not be successful.

The proposals are:

Completion of	Stage One	— Diploma in Actuarial Techniques
	Stage Two	— Associateship
	Stage Three	— Fellowship
	Stage Four	— Advanced Certificates.

5.3 *Specialisation*

The proposed model allows an actuary to specialise in one area to Fellowship level, after a broad-based training to the end of Stage Two. It was not felt appropriate to introduce specialisation earlier in the qualification process. The broad-based training will help students to develop an understanding of actuarial principles in a range of areas. It is intended that there will not be a detailed consideration of legislation and regulations in any subject up to, and including, Stage Two.

5.4 *Application Areas for Actuarial Skills*

The approach taken is to provide students with a wide range of actuarial tools. However, it is felt appropriate to use the Stage 4 CPD as the main level at which detailed applications in a wide range of areas might be considered. This has the advantage of not overloading the qualification process, and also allows more flexibility and opportunity for experimentation. The introduction of advanced certificates is a key aspect of this strategy.

5.5 *U.K. Regulation and Legislation*

The treatment of the subjects at Stage Two will have an emphasis on generic principles rather than U.K.-specific practice. It may be difficult, and indeed not desirable, to remove an implicitly U.K.-oriented approach from this stage, but the introduction of examples and case studies will help to achieve a broader perspective. Any systematic consideration of current U.K. regulation and legislation will be postponed until Stage 3 Fellowship. This will be reinforced in Stage 4 CPD, where there will be a need for continual updating for an actuary, as issues and practice develop.

5.6 *Syllabus Content*

The balance in syllabus content proposed represents a shift from historical

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techniques to a wider range of tools. A new subject proposed is stochastic processes.

5.7 *Assessment Methods*

More work has to be done on this area, but Section 6 gives some further details.

5.8 *Evolution or Revolution?*

The ECPD Board believe that an evolutionary approach is correct, and has been supported by Councils. Clear transitional arrangements will be presented at the next stage of development.

6. EXAMINATIONS

Students will have to pass the equivalent of 16 examination papers. These comprise:

	Papers	Hours of examinations
Stage 1	9	25
Stage 2	5	14
Stage 3	2*	6*
Total	16	45

* These assessments may not be fully by unseen examination.

Under the present arrangements students have the following examinations:

	Papers	Hours of examinations
A-D	8	24
E-H	8	24
Fellowship	2	$4\frac{1}{2}$
Total	18	$52\frac{1}{2}$

The number of hours of examinations and the number of papers is thus reduced under the new strategy, although each paper, in future, has to be passed independently, whereas, at present, the eight papers in Subjects E-H are assessed as four subjects.

It is hoped that a broadly similar amount of study will be required for each examination of three hours duration. If this can be achieved, then the aim will be to reduce the overall load under the new strategy. As a rough guide, each three-hour examination should generally require about 150 hours of study time in preparation. A two-hour examination should correspondingly require about 100 hours of study time.

The nature of the examinations for each part must depend on the aims and objectives for that part.

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The Foundation Stage is testing knowledge and the ability to apply knowledge within simple applications and within a problem-solving context. It is likely that the format of the papers will remain similar to those currently used in Subjects A-D. This is 50% on multiple-choice and short answer questions, aimed at testing knowledge and simple applications, and 50% on long questions, which test some problem-solving ability.

The Application Stage is testing the student's ability to use the Foundation Stage concepts within the framework of the principles of key applications areas. Most of the questions are likely to be long, because the emphasis is on principles, and not on detailed knowledge.

The Fellowship Stage is testing the ability to use subject knowledge and other actuarial skills to solve problems. The first paper is likely to be primarily long questions. Consideration is being given to alternative forms of assessment from unseen examinations for the second part of the Fellowship examination, as an alternative test of the skills to be demonstrated at this level.

The subjects may be taken in any order, although students will be advised to study the Foundation Stage subjects in the order presented. It will also be advisable to study the Foundation Stage before the later stages. Students will be advised to take the Stage 3 Fellowship papers towards the end of their studies.

7. SYLLABUS AND CORE READING

The syllabuses will continue to be presented in learning objective style. Core reading will need to be developed for each of the subjects in the first two stages and the first paper of the Fellowship Stage, to aid understanding of the depth and breadth of the syllabus for tutors, examiners and students. Guidance for the second paper of the Fellowship will need to be determined separately. Specimen examination papers will need to be prepared to give further guidance to all concerned.

8. TIMETABLE

The speed of development of any new strategy is subject to conflicting pressures. The findings of *The Future of the Profession* report and the current concerns with the existing strategy suggest that a fast timetable for change should be set as given below. Developments internationally in the IFAA and the Groupe Consultatif could lead to a slower timetable.

1996

1. 30 September — Discussion on overall strategy at Joint Councils Meeting
2. 30 November — Paper published for wider consultation

1997

3. 15 January — Detailed comments received from Boards
4. 31 March — End of wider consultation
5. 31 May — Detailed syllabuses prepared

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1998		
6.	31 January	— Core reading prepared
7.	31 May	— Full details of new strategy published
8.	1 September	— New tuition courses published
1999		
9.	11 April	— First series of new examinations.

In the preparation stage, development of some activities will begin before the end point of previous actions.

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THE SESSIONAL MEETINGS

Each Sessional Meeting took the form of a structured discussion on the paper as presented, and each discussion was divided into three sections, covering:
(1) the Foundation Stage;
(2) the Application and Fellowship Stages; and
(3) assessment, qualifications and CPD.

The list of issues, which, it was hoped, would be covered in each of the three sections of the discussions, is as follows:

1. *The Foundation Stage*
— Should we be strengthening the mathematical and statistical content of the foundation subjects as proposed?
— Is it right to emphasise the role of models in actuarial work?
— Are the proposals well targeted to provide the technical skills likely to be needed by actuaries in the future?
— Is there a risk that students with non-mathematical degree subjects will be discouraged from entering the profession?
— Is it appropriate to leave the entry requirements unchanged?

2. *The Application and Fellowship Stages*
— Is the proposed approach to specialisation appropriate?
— Is it appropriate to concentrate on principles at Stage 2 and to assess country-specific practice and legislation only at Stage 3, as proposed?
— Should we move closer to the Australian approach, under which actuarial principles are presented in a generalised way, rather than retaining four separate subjects at Stage 2?
— Should further Fellowship subjects be introduced, and if so in which areas?

3. *Assessment, Qualifications and CPD*
— Should assessment methods other than closed book examinations be used, particularly for the Fellowship Stage?
— Should the Faculty and the Institute be prepared to grant exemptions at the Applications Stage to students who have successfully completed relevant university courses?
— It is proposed to retain an examination in communication skills. Is this appropriate?
— Would intermediate qualification serve a useful purpose, if Privy Council approval can be obtained?
— How can actuaries be encouraged to enhance their skills through CPD?
— What arrangements should be put in place for individuals wishing to move from one area of specialisation to another?

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ABSTRACT OF THE DISCUSSION

HELD BY THE INSTITUTE OF ACTUARIES

The President (Mr D. G. R. Ferguson, F.I.A.: The strategy in the paper introducing this meeting has been wholeheartedly endorsed by both the Institute and the Faculty Councils. You may think that that is a very good reason to throw the whole thing out lock, stock and barrel, but I hope you will not. A great deal of work has gone into it.

Our objectives in this discussion are, ideally, to seek a ringing endorsement from the membership that we are on the right lines, so that we can press ahead with the implementation of the strategy, but, failing that, to make sure that we take account of your comments and suggestions for things that need to be changed before it is too late.

Mr N. J. Dumbreck, F.I.A. (introducing the paper)**:** The main impetus for the proposals that we are discussing came from 'The Future of the Profession' study (*B.A.J.* **2**, 325-427). The study team looked at what actuaries might be doing in 2005, and provided some high-level comments on the implications of their findings for the education and training of actuaries. Much of the discussion on their report at Sessional Meetings in Edinburgh, London and elsewhere focused on education, and there was general agreement that changes to the examination syllabus were needed, even though the current syllabus had only been in put in place two years earlier.

Three main educational themes emerged from the study and the ensuing discussion. The first was that actuaries would need broader and stronger technical skills in the future, including, in particular, a better understanding of stochastic methods and financial economics. The second was that some increase in specialisation was likely to be necessary in the later stages of the education process, perhaps coupled with a lower level basic qualification. The third was that we needed to tackle the problem, perceived by the Board of Examiners and others, that the current education process concentrates too much on assimilating knowledge and does not promote deep learning. This is felt by some to be one of the main causes of low pass rates in the later examinations.

The Education and CPD Board has had these themes firmly in mind in developing the current proposals. I believe that there is broad support within the profession for the general direction of the proposed changes, but that there are some differences of view on how they should be implemented. I hope that this discussion will help us move towards a consensus.

Dealing with the Foundation Stage, there is no doubt that the Board's proposals involve a material increase in the amount and level of mathematics in the syllabus. This is felt to be necessary, not only to equip actuaries to add value in the wider fields, but also to enable them to hold their own in more traditional areas. However, some actuaries are concerned that a likely consequence of better mathematical training is that actuaries will become less practical and commercial, and that the profession will attract the wrong sort of recruit. There is also a worry, in some quarters, that the proposals will promote a slavish adherence to models such as the Black-Scholes framework and the Capital Asset Pricing Model, which are based on unrealistic premises.

I do not believe that these concerns are justified. After all, most actuarial trainees start with a very high level of mathematical ability, and there is no reason to believe that the profession attracts only those who have no desire to maintain this ability. The more we eschew core mathematical skills and concentrate on practicalities, the more we risk opening the way for other professions to compete with us. Moreover, if we enable actuaries to understand complicated financial models, they are more likely to be aware of their defects, and to be able to work around them, than if they have only a superficial appreciation of the models.

To address some of the concerns that have been raised in this area, it is proposed to rename the new Subject 5 'Stochastic Modelling', and to expand its scope to include consideration of the use and abuse of models.

The increased emphasis on mathematics may make it more difficult for those with non-mathematical backgrounds to become actuaries, and we will need to consider ways of bringing up to speed those who lack the necessary knowledge, but are determined to acquire it.

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Moving to the Application Stage, the big question here is what degree of specialisation is desirable. The Board's proposals involve extracting most of the United Kingdom-specific detail from the life assurance, pensions and general insurance courses, and concentrating on the underlying principles. This will remove the need for students to acquire large amounts of knowledge on subjects outside their chosen practice area — knowledge which quickly becomes out of date. It should also help to move the emphasis of the education process towards understanding and deep learning. If the change is to be successful, the tuition process will need to be re-orientated, away from the current spoon-feeding approach, towards encouraging students to think for themselves.

The main argument in favour of specialisation is that, as life becomes more complicated, it is necessary to focus the student's education on the area in which he or she is expecting to work, in order to provide sufficient depth of coverage. There is some opposition to this idea — in particular, there are some legitimate concerns that moving country-specific detail to the Fellowship Stage will make it more difficult for actuaries to work in more than one practice area, or to change careers. We will need to find ways of addressing these concerns outside the qualification process. There is also a contrary view, that we have not gone far enough towards specialisation, and that actuaries who wish to work in general insurance, for example, should not have *any* life assurance or pensions inflicted on them. The proposals aim to strike a balance between these opposing views. The Board feels that there is merit in continuing to educate students separately in each of the main practice areas, but in a way which draws attention to similarities and differences in practice between these areas. We believe that it is premature to move towards the system being adopted in some other countries, of treating the actuarial control cycle as a single subject covering all practice areas.

The third main area for discussion concerns assessment methods, intermediate qualifications and CPD. I have very little to add to what is in the paper on these issues. On assessment methods, the ECPD Board's current intention is to proceed cautiously towards introducing some form of open book examination at the Fellowship Stage. Having looked at the experience of other professions, we can see considerable merits in the case study approach, but are also mindful of the amount of work involved in developing suitable tuition and examinations. We will probably not be able to complete such work in time for the first set of examinations under the proposed syllabus, and a phased changeover may be necessary.

Changes to the profession's education system are not to be undertaken lightly. Students find them very disruptive and unsettling, and they create a great deal of work for everyone involved in the education and examination process. It is clearly important that we get these proposals right, and that they are implemented in an orderly way. This meeting is an important part of the process of refining the proposals.

1. *The Foundation Stage*

Professor A. D. Wilkie, F.F.A., F.I.A.: I am Chairman of the Faculty and Institute Investment Committee, and I welcome the proposed new education syllabus. It goes in the right direction for the Investment Committee, introducing into the Foundation Stage some elements of financial economics which we have had to include in the syllabus, optionally, through the Advanced Certificate in Derivatives, and possibly through other Advanced Certificates in subjects such as asset/liability modelling and stochastic asset models, which are currently under discussion.

The proposed changes in the syllabus do not relieve us of the need for going ahead with possible Advanced Certificates, because:

(1) many qualified actuaries have not studied these advanced investment subjects, and wish to do so; and

(2) the proposed new syllabus only goes one step in the direction of training 'investment actuaries', whereas we need to go three or four steps.

This revision of the syllabus goes in the right direction, but, in due course, we shall see that it has not gone far enough. We shall need to introduce more specialisation at some time. There is too much that investment actuaries need to learn to fit into the present, almost uniform, syllabus, and I expect that the same is true for general insurance, pensions and life insurance.

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This section of the discussion is about the Foundation Stage, and I want to compliment the designers of the syllabus on their two new subjects, one on financial economics, the other on stochastic modelling. There will be some actuaries who feel that they have passed their lives without knowing about stochastic processes, and see no reason for others to learn; but, like the man who had spoken prose all his life without knowing it, they have been using stochastic processes all their actuarial lives.

The syllabus for this subject ought to include discrete space and continuous space processes, discrete time and continuous time processes. You will appreciate their range when I say that this should include no claims discount systems in motor insurance, life tables, multiple state sickness and PHI models, pension fund service tables, marriage tables, Poisson processes as in risk theory, time series models like the Wilkie stochastic model, as well as continuous models like Brownian motion, which are useful, and often necessary, for an understanding of modern option pricing theory and other aspects of financial economics. The mathematics for all these was originally difficult, but, in recent years, it has been shown how the subjects can be taught in such a way as to make it easy for actuaries to use the methods and get results, without getting bogged down in too much pure mathematics.

There will be those who say that we should not be teaching mathematics to actuarial students. If they mean that we should not teach *too much* mathematics, then I agree, but if they mean that we should not teach *any*, then I strongly disagree. We need to teach enough, so that the actuary knows how to model the problem facing him or her, and knows how to manipulate the mathematics to get the solution he or she needs. More than this may be interesting, but superfluous; less than this leads to the danger of training actuaries who show themselves to be incompetent and unprepared for the modern world.

Dr A. J. G. Cairns, F.F.A.: I quote:

> "...it is considered by many as dangerous, in an official and commercial sense, for any actuary to show that he has been studying other books and productions than directories, prospectuses, and advertisements [1997: *books and productions written by other members of the actuarial profession*]; but I trust that a better spirit is beginning to prevail, and that, within the walls of this Institute at least, any advocacy for the improvement of the theory of our subject will be immediately seen as also implying a desire to improve its practical aspects. Speaking for myself, I have long considered the wants of the public are daily forcing upon actuaries the investigation of subjects which the incompleteness of the prevailing theory renders it too powerless to grapple sufficiently with; and it is the hope of exciting attention to this view of the matter that has induced me to offer the present paper [1997: *the current education review*]. Considerable difficulty, as may be imagined from its [*Farren's* 1855 *paper*] tenor, has been felt in keeping it within due bounds; for, had examples of general limits been chosen, the subject in this form appears to be at present so little understood in its practical bearings, that at least the range of a lengthened essay, if not a volume, might have been required to treat the matter [*the use of probability*] with that fullness of illustration which the importance of it demands. It may therefore be allowable for me to attempt to reinforce the object of so circumscribed a paper by a general declaration on my part that, after having devoted considerable attention, and indeed some years, to the subject, I feel confident that the proposed change from an invariable to a variable calculus as the basis of our calculations will be beneficial in every respect. We shall thereby be able to dismiss wholly the ancient doctrine of chances with its fixed equalities of paper cards, wooden dice, and similar mechanical illustrations, and rely more upon the more modern doctrine of probability, as the science of observation based upon experience. The actuarial adaptations of this doctrine, aided by calculus [1997: *stochastic processes*], will assuredly ultimately bring a class of problems involving averages and their fluctuations within reach of our solutions which at present are merely statistically guessed at, even by the most experienced actuary [1997: *and going under the banner of actuarial judgement*], the most cautious finance minister, or the most learned political economist [1997: *not to be confused with financial economists*]. To improve our own

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> science, moreover, is virtually a step towards the improvement of others [1997: *taking a leaf out of the books of others*], and thereby the better helps us to substantiate the claims of our studies to those designations of learned and liberal so highly prized by other professions."

You may think that what I have just said sounds a bit odd. This is because they are not my words, but are those of Edwin Farren, a past Vice President of the Institute. What I find really depressing is that these remarks are recorded in Volume 5 of the *Assurance Magazine and the Journal of the Institute of Actuaries*, which was published in 1855 (pages 185-196 and 254-255).

However, I wholeheartedly agree with what Mr Farren said, all that time ago. What is amazing is that we are effectively having the same discussion, 142 years on, about whether or not we should learn a decent bit of probability. If anything we have regressed since 1855. In that volume of the *Journal* there were several papers analysing problems involving both stochastic mortality and (rather surprisingly) stochastic interest. Nowadays the majority of actuarial papers in the U.K. tend to smother the stochastic element in deterministic methods with hidden margins and backed up by supposed actuarial judgement. Furthermore, in 1855 we were clearly at the leading edge of statistics and finance; now we are not, because we have sat back rather smugly since the end of the 19th century, while other professions have sped on past us.

This profession is at a cross-roads. There are a number of excellent proposals before us, including stochastic processes and financial economics. If the profession does not take these on board, then it will rapidly become intellectually bankrupt.

Dr S. M. Coutts, F.I.A. (in a contribution that was read to the meeting)**:** There are a number of actuaries in general insurance who believe that some of the newer students may consider taking United States Casualty Actuarial examinations, since the U.K. examinations contain life and pensions. Maybe these students do not recognise that there is a large section in the U.S. examinations dealing with their local legislation. I believe that the U.K. actuarial system is better than the U.S. split system, because the longer I work as an actuarial consultant, the more I believe that the use of cash flow simulation models (deterministic models being a sub set) is one way to teach actuarial science. I consider that general insurance, life assurance, pensions, and even extending to banking, property and financial instruments, have similar cash flow models, the only difference being the parameters of interest. Hence, there is a need to teach general and life assurance and pensions to young actuaries.

I would have liked to see a general subject called 'cash flow models' taught, giving the structure of assets and liability models. For example, Sections 6, 8 and 9 of the 'Proposed Model for Development of Education and CPD Strategy', discussing the new syllabus, can easily be incorporated in a general model, that is profit testing, control cycle, pricing and computer applications and simulations, rather than separately for general insurance, life and pensions. The overall syllabus would also consider different asset models, for instance one day ahead, one week ahead, one month ahead, one year ahead or five years ahead. Then, at advanced courses, specific consideration for different parameters could be discussed.

Also, I am distressed to see such mathematical detail in Section 5 of the proposed syllabus. I would like to see what justification there is to teach this high-powered mathematics, when simulation can do much better. I certainly would like some emphasis on general linear models and their use in premium rating.

Finally, I would like to see a detailed discussion with the practitioners before the academics take over our syllabus.

Mr J. Goford, F.I.A.: I have concentrated, in the last few months, on the issue of strengthening the mathematical and statistical content of the foundation subjects, in general, and the new Subject 5 in particular. Firstly, I understand that the new Subject 5 has been biased towards a more general syllabus of what is a model and how should it be used; in particular, I understand that it may be biased more towards the draft proposed by the IFAA including:

— time series analysis;
— multi-state models;

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— probabilities of transfer;
— transition intensities;
— maximum likelihood estimators;
— piecewise constant transition intensities;
— why and how models are used;
— the benefits and limitations of modelling;
— deterministic versus stochastic models;
— model selection;
— analysis of input;
— analysis of output;
— sensitivity testing of assumptions and results; and
— communication of results.

In my investigations I have come across an intensity of feeling both for extra mathematics in the examinations and for extra pragmatic understanding of the uses and limitations of all models. All agree that stochastic modelling and the Black-Scholes approach are very important in all disciplines. The issue is how much back-up, support and proof are needed. I am still sitting on the fence on this issue, and if we can find a solution which permits a greater understanding of the uses and limitations of models, and, at the same time, includes some additional mathematics to support those ideas, then I shall be well pleased. However, we should also bear in mind that we are in the business of producing embryo actuaries, not perfect, fully-formed actuaries. The logical pros and cons seem to be:

(1) for more mathematics:
   — The Subject 5 topics seem to be useful on their own in general insurance, except for martingales, stochastic differential equations and stopping times.
   — The Subject 5 items are essential to understand the Black-Scholes framework.
   — Learning the building blocks and the proof of the Black-Scholes formula helps the embryo actuary develop the framework into unfamiliar territory.
   — We have to be familiar with the Subject 5 items in order to catch up with financial economists.

(2) and for more pragmatism:
   — There seems to be no need for martingales, stochastic differential equations and stopping times to be included in the syllabus.
   — Subject 5 is an inhibition to non-mathematical recruits.
   — Students who feel the need to prove the Subject 5 items will do so, in any event, in their own time.
   — Most of Subject 5 is already covered in most mathematical degrees.
   — The learning of proofs detracts from the learning of the uses and limitations of the results. To draw a parallel example, the formula $A+Bc^x$, fitted to mortality data, does not tell you about the deaths of motorcyclists at age 19.
   — One may as well assume that the result of a proof is true, as that the opening assumptions are true, for example that the world is log-normally distributed.

Unless I can find some other convincing arguments which move me off this particular fence, my bias will be towards promoting pragmatism, that is subjects of direct relevance to clients and their customers, enabling students to qualify faster and leave them, as embryo professionals, to fill in their gaps in knowledge themselves.

Professor M. Sherris, F.I.A. (in a contribution that was read to the meeting): My comments are confined to the Foundation Stage and the proposed structure of the courses.

I endorse the objectives of strengthening the mathematical and statistical basis of the foundation subjects, providing access to financial economics, and the greater emphasis to be placed on models as links between data and applications. The changes that are proposed are essential if the actuarial

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profession is to have any relevance in the financial services sector beyond its traditional and diminishing role. The profession must adapt its syllabus to the needs of its students and for its long-run survival. At the international level, the U.K. profession has come to be seen as backward in the mathematical, statistical and financial basis of its foundation education. This seems to have been the result of the efforts of a small number of influential U.K. actuaries who consider anything to do with financial mathematics as heresy.

This phenomenon does not appear to exist anywhere else in the world. The Society of Actuaries in North America and the Institute of Actuaries of Australia embraced finance and financial mathematics in their syllabus years ago, and many young actuaries in these countries are now enjoying well paid and rewarding careers in the finance industry as a result. It never ceases to amaze me that risk theory does not get criticised by these U.K. actuaries. It is taught in some detail in the U.K. syllabus, yet the assumptions underlying this area of study are even more unrealistic than those used in finance theory. For example, assets do not even earn interest! So I must congratulate the U.K. profession for at last recognising the weaknesses in its syllabus and taking action to remedy them.

I would like to suggest some improvements to the proposals. Subject 2, 'Financial Mathematics', should be merged into Subject 4, and this new subject should cover topics such as bond valuation, loan evaluation, interest rate risk, capital structure, investment evaluation, balance sheet analysis and the effect of taxation. This material is largely covered in business finance/corporate finance texts, and this should be the basis for this subject. These corporate finance texts include coverage of much of the material in the current mathematics of finance syllabus, albeit at a more basic level. The bond valuation and interest rate mathematics required would be at a higher level than covered in these texts.

Subjects 5 and 9 should be merged into a financial mathematics subject emphasising stochastic modelling. This would cover the stochastic approach to financial mathematics, including the application of martingales, Brownian motion and stochastic differential equations to finance, which would cover option valuation models (including Black-Scholes) and term structure models, with an emphasis on the mathematics and assumptions underlying these models. The texts that could be used for this subject might be, for example: *Financial Calculus, an Introduction to Derivative Pricing*, by M. Baxter & A. Rennie (Cambridge University Press, 1996) and *The Mathematics of Financial Derivatives: a Student Introduction*, by P. Wilmott & J. Dewynne (Cambridge University Press, 1995). This subject could also cover portfolio theory mathematics. It should then lay the foundations for a later Application or Fellowship Stage subject in finance that emphasised the practical aspects of finance, including the use of derivatives, risk management, etc.

The Institute and the Faculty should introduce a new subject, Applied Actuarial Modelling, similar to Course 7 of the proposed Society of Actuaries syllabus, which emphasises the practical application of actuarial modelling. It would cover topics such as principles of modelling, model design, calibration of models, modelling software, output analysis and communication of results, and should have an applied actuarial focus. Generalised linear models and their use in insurance, econometric models and their use in financial applications, as well as time series models and their actuarial applications, would be covered.

These changes would result in 8 subjects, as at present, instead of the 9 proposed. I would also suggest that the Australian model with the Actuarial Control Cycle, followed by a choice of 2 subjects from 5 at the practice level, should be a model for the later stages of the U.K. syllabus.

I also feel that the syllabus needs to strengthen the mathematical basis for the foundation subjects by including more numerical analysis as an integral part of the syllabus. This should be taught in conjunction with the use of a computer package (such as MATLAB or a spreadsheet). The topics that need to be covered include differential equations, difference equations, interpolation/extrapolation, curve fitting and optimisation. The actuarial applications need to be emphasised along with the use of the techniques, in a range of areas. For example, the fitting of curves, interpolation and extrapolation has applications in mortality (fitting mortality curves) and in finance (fitting yield curves). Solving difference and differential equations has applications in life insurance mathematics and the mathematics of finance. Optimisation has applications in all areas of actuarial work, as well

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as in finance, including matching and portfolio selection. These common applications are not drawn out enough in the current syllabus. For instance, students study curve fitting in mortality without realising that the techniques have a wider use.

The syllabus must also emphasise the links between the different subjects, as well common themes and techniques. For example, survival models have applications to mortality and disability and also to modelling default rates on bonds. As another example, the economics of risk apply both to insurance as well as to finance.

The U.K. profession has an opportunity to make its syllabus for its foundation subjects the model syllabus at the international level. I hope that it takes this opportunity. I know that what is required will involve much effort, but the long-run benefits to the profession will make it worthwhile.

Mr S. J. Green, F.I.A.: My main concern is that it takes so long between graduation and qualification. The main aim should be to get actuaries to qualify more quickly. I suggest that, at the Fellowship Stage, they should only have to take one paper. Having said that I want to see actuaries qualifying more quickly, there are two subjects which we pass over too lightly. The first is economics. I cannot understand how any actuary advocates the teaching of economics without teaching at least elementary demography, which was dropped some years ago. I should also like to see reversions, at an elementary level, reintroduced, because these can be valued without using models.

I agree with Professor Sherris that we should be teaching more mathematics, and the suggested combinations appear to be balanced. We were told earlier that we do not read enough. Unfortunately, most of the people who advocate the Black-Scholes approach do not appear to have done so. Fisher Black (half of Black & Scholes) wrote, at a later date than the original formula appeared: "The Black-Scholes formula is still around, even though it depends on at least 10 unrealistic assumptions. Making the assumptions more realistic has not produced a formula that works better across a wide range of circumstances". He wrote three papers on these lines, and for the rest of his life he taught that theme. If he did not believe in the Black-Scholes approach, then why should we be teaching the formula to our students?

Professor Eugene Fama is the man generally credited with the efficient market hypothesis, yet he discredited it at a recent seminar. Several years ago Professor Markowitz told me that he did not believe in the efficient market hypothesis theory. He said that there was nothing in what he wrote in his 1952 or 1959 papers that actually referred to efficient markets, yet we have, in this profession, people still teaching the hypothesis.

If we are going to teach financial economics, I am pleased that we are starting to use the correct terminology. Derivative securities were being traded in London 70 or 80 years ago. They were probably being traded in America well before that. They are, almost certainly, based upon the futures and options in the commodities markets which were being traded well over 100 years ago. We should bring our reading up to date. We should not be teaching students discredited methods, but current ideas.

Mr J. M. Pemberton, F.I.A. (in a contribution that was read to the meeting)**:** The recent 'Future of the Profession' investigation identified stochastic modelling as a major area for future development. That is a proposition for which there is widespread support. In a recent survey of life offices it was discovered that only one in seven offices used any form of stochastic modelling in monitoring its business. That seems to be uncomfortably low. There is a need to accelerate the pace of progress in introducing stochastic modelling into the mainstream practice of the profession, and, therefore, into the educational syllabus. The educational proposals in this paper are shifting the focus in the reverse direction. Rather than developing skills in practical stochastic modelling, we are proposing to introduce more mathematics.

In the context of education, the criterion for introducing material into the core syllabus is that the material should have widespread application for practitioners. As a practitioner in a life office, I do not see examples of the proposed mathematics being used; nor have I seen practical examples presented, indicating how it might be used in future by practitioners.

The introduction of new educational material into the syllabus is an important step — it implies

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either that we reduce the teaching of parts of the existing syllabus or we increase the length of our examinations.

I am not sure that the case has yet been made for the inclusion of further abstract mathematics into the core syllabus. I hope that the profession will reflect on the importance of these moves, and pause to allow a wider cross-section of the profession to debate these important issues.

If we are to introduce new material into the syllabus, my preference is to support the growth of practical stochastic modelling skills amongst our students. This seems to be an area which is now sufficiently well-established within the practice of the profession to be introduced into our core educational material.

Professor H. R. Waters, F.I.A.: I support, in general terms, the proposed structure for the Foundation Stage. In particular, I welcome the strengthening of the mathematical content and the introduction of stochastic processes as a separate subject.

We should not turn our backs on mathematics. Our mathematical skills are a distinctive feature of our profession. If we try to dilute the mathematical skills required to be an actuary, we will become indistinguishable from other professionals, for example accountants or management consultants.

'The Future of the Profession' report (*B.A.J.* **2**, 325-427) emphasised the need for actuaries to develop skills in stochastic modelling. This report also contained the statement: "The emphasis of initial education should be on skills and methods which have general application." We are discussing here a structure designed to educate and select people fit to be actuaries. These actuaries will have future working lifetimes of up to 40 years, or even longer. We cannot be sure what tools they will require in the future, but we can be sure that they will require additional, and, in some cases, more technically advanced, tools than those in current use, and that many of these more advanced tools will have some sort of stochastic process at their heart.

Actuaries deal with financial problems involving future uncertainty, sometimes over the long term. Stochastic processes are nothing more than a mathematical way of expressing uncertainty, or randomness, over time. They are a natural part of an actuary's toolkit.

I see an understanding, at some level, of stochastic processes as an essential skill for actuaries in the future, but we should realise that applications of stochastic processes have been part of our toolkit for many years, even decades; for example:

— the Wilkie investment model;
— stochastic simulation in general insurance, life insurance and pensions;
— option pricing models developed by financial economists; and
— multiple state models for AIDS and for permanent health insurance.

In the Notes for this meeting you will find the question, "Is it right to emphasise the role of models in actuarial work?" My answer is an emphatic, 'yes'. All the applications that I have mentioned involve models of the real world. Models are important, even fundamental, in actuarial work, for example the model for the mortality of a population represented by a life table or the model of a life insurance portfolio underlying the net premium valuation method. No model represents reality exactly, so that the construction of a model and the interpretation of results derived within a model can require considerable skill and experience; that is judgement. If we are to be able to exercise this judgement in respect of any model, we need a good understanding of the assumptions underlying the model and of the mathematics used to derive results within the model. Since many of these models will have some sort of stochastic process at their heart, an understanding of stochastic processes is essential for actuaries.

Mr S. J. B. Mehta, F.I.A.: My view is that actuaries should have a key role to play in the financial services sectors. They should be at the forefront of both practical and theoretical developments in issues pertinent to financial management, both in the insurance and pensions industries, and more generally, for example, in promoting involvement in capital projects and collective investment schemes.

It appears that many of us are agreed that a good grounding in financial economics is desirable,

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but an issue raised is whether it is necessary to understand the proofs of the Black-Scholes equation. First, I make the point that the efficient market hypothesis is not the same as the Black-Scholes formula, which does not rely on the efficient market hypothesis. The Black-Scholes formula is widely used throughout the banking community in all aspects of its business. Great care is used to ensure that the assumptions selected are reasonable. Understanding the proofs is desirable, for the following reasons:

- Actuaries are often analytically inclined, and are not inclined to use techniques that they do not fully understand.
- We need, as a profession, to improve our standing within the financial community. There is a significant danger of us being left behind developments, particularly as many actuarial approaches can be seen to lack theoretical rigour, given post-war advances in financial economics.
- Although the Black-Scholes arbitrage framework underpins all, or virtually all, robust option pricing, just learning the formula does not suffice. In actuarial work one, typically, needs to understand the logic behind the formula, because one is often not dealing with standard options. To take one example, LPI annuity profiles will become standard for almost all U.K. pension funds. Accurate asset/liability management, hedging and pricing of these payments requires building in a term structure of interest rates — something that the original Black-Scholes formula did not tackle.
- It is also important to have followed a proof to understand the significance of the contributing hypotheses. For example, a cursory examination of the Black-Scholes formula may suggest a proof based on discounted cash flow and the premise that equities carry no risk premium relative to bonds. The obvious flaws in this premise relative to historic data could then appear, at first sight, to undermine the Black-Scholes formula. However, such criticism would be unwarranted, because the original premises of the construction were far more general, and, indeed, have been further generalised since 1973. A more careful analysis of the proof reveals that the risk premium is not assumed to be zero, but rather is self-cancelling within the mathematics. Such a profound result is not evident from staring at the formula alone.
- We need to equip future generations of actuaries with the tools needed to face an increasingly competitive, financially sophisticated world. Not providing them with a sound background in financial techniques could unnecessarily hamper their career opportunities.
- The recent 'Future of the Profession' debate suggested that stochastic modelling was likely to become of increasing importance. In this context, an understanding of financial mathematics is important if we are to avoid some of the very damaging controversies that have arisen within the profession in the last year or two.

It would be interesting, for example, to ask some American actuaries for information on the response to the introduction of financial mathematics into their education syllabus. There is increasing interest in this across Continental Europe, and it would be a pity if the U.K. could not maintain a lead.

2. *The Application and Fellowship Stages*

Mr J. P. Ryan, F.I.A.: Essentially, the Application Stage is dealing more with a narrow base of techniques to a broader range of practice areas. This approach is ideally suited to the technical middle management of a composite office. This accounts for around one-third of the population of actuaries at the moment, and is, to some extent, a declining proportion.

Many embryonic actuaries want to use a broader base of skills to the areas in which they practice — that is a broader range of skills to a narrower base. Since we are constrained on examination time, there has to be some give in that respect. This is particularly true of general insurance, an area in which I have considerable experience. This also applies to many pensions consultants and many specialist life office practitioners, especially those working in life companies that do not write general insurance and have limited pensions exposure. It also restricts those actuaries who aspire to a broader role rather than just a straightforward technical actuarial role.

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The people who fall into this latter category account for some two-thirds of the overall population of actuaries at this time, and one that the Future of the Profession Working Party identified as growing the fastest. This change in this area in the Application Stage does not fully meet their needs, nor, possibly more importantly, that of their employers.

We, as a profession, lost our role in the investment field because our educational system did not meet its needs. At that point I was active in the investment area. To some extent we could be in danger of losing out in the general insurance field for the same reasons. The London Re-insurance and Market Association has already written to the Institute querying some of the relevance of the syllabus to some of their members. The Chartered Insurance Institute (CII) has introduced some elements in the actuarial field. They are not trying to train actuaries; they are trying to teach their own staff more about actuarial methods, and that is something that we, as a profession, should welcome. Nevertheless, if we fail to meet the demands of the general insurance industry, the CII may move further by extending its examinations.

Individual employers have to spend much time training people in other activities in order to make them useful in their offices. A number of employers are querying whether there are better ways of training their people, not only in general insurance, but also in other fields outside the straightforward actuarial exams. Therefore, we need to consider the Application Stage in some detail from this point of view.

We should not change the approach for the third of our members who are in the traditional areas of our population. For the remaining two-thirds the Application Stage, therefore, needs to provide at least three options; Professor Wilkie implied a possible fourth in order to regain some of the investment ground.

The emphasis should still be on principles and applications, but using a much wider range of skills, including perhaps, some legal or financial and other aspects, but only applying to one field. Detailed U.K. knowledge should still be restricted, and be constrained to the Fellowship Stage. The Foundation course would remain entirely the same, although, if possible, it would be desirable to study that in parallel with the Application Stage. The emphasis must be on the use of mathematics rather than the theoretical development.

This is clearly a more expensive route for the profession, with these extra options, but the majority of employers and students will see the greater relevance of their training. Indeed, it will cut many training costs elsewhere for employers.

If we do not take this course of action, we will find ourselves left out of a number of key and growing areas, such as general insurance, and in the same way as we were with investment some 20 or 30 years ago.

Mr G. D. Clay, F.I.A.: Recently I have spoken to five different Asian actuarial societies on recent developments in the U.K. One of the topics covered was these proposed changes, and I now report to you on some of what came from those meetings. In almost all these countries we are in competition with the Society of Actuaries for potential students, and there seem to be two things which affect the choice made by their students. The first was the prevalence, or otherwise, of multiple choice questions in the earlier stages of the examinations, which is of considerable assistance to those for whom English is a second language. The second was the volume of U.K. legislation and practice in the later subjects, which makes the examinations virtually impossible to pass at a distance, unless working for a U.K. employer which could provide suitable support. There was considerable interest, therefore, in the suggestion that it should only be the Fellowship paper that included any legislative or taxation background, and also in the possibility that, ultimately, that paper might be set on the basis of the local environment, and marked locally.

I now have two questions:

(1) Have we addressed, in this paper, sufficiently clearly, the distinction between what *every* actuary needs to know and what *some* actuaries may want to know or, as a result of their particular sphere of activities, may need to know? We are in danger of putting too much into the Application Stage, which is not really of universal importance to those practising in that particular area. On the other hand, there is not enough investment material in the Foundation

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Stage to provide a suitable background for those who will specialise, for example, in the life and pensions areas.

(2) Is there, perhaps, too much of the basis for the investment paper and not enough of the general background to investment which is of value to almost all actuaries? This needs to be made clearer.

The general question of breadth or depth is an area where we are perceived as having an advantage over the American system, in that, by confining specialisation to the post-qualification stage, we give a broader general education to actuaries, and, therefore, facilitate the movement of individuals from one area of practice to another, which, over a 40-year working career, would seem to be quite likely. That is something worth seeking to preserve, providing that it is a relatively basic level of knowledge in the four current areas of practice.

Mr C. D. Daykin, C.B., F.I.A.: On the question of specialisation, I have always been a firm believer in the breadth necessary in order to be a good actuary. It is essential that those who qualify as Fellows of our Institute or of the Faculty have an adequate grounding in at least the main practice areas in which actuaries are involved in the U.K.: investments; life insurance; general insurance and pensions. There are other areas which, arguably, could be included. They are not as central at this stage.

The previous education review was reluctant to acknowledge this. It was not because the Education Strategy Working Party, at the time, did not want to go further in this direction, but there were strong feelings within the profession that we should not go too far in the direction of allowing people to specialise within the FIA or the FFA, and so we went for a system where subject Q was designed to test additional skills rather than additional knowledge. Therefore, there was supposed to be no formal additional content in terms of knowledge about one's own particular subject area, introduced at subject Q, but more a testing of critical analysis, an ability to synthesise material and to communicate.

What we are seeing in these proposals is a step further in the direction of specialisation, and the real debate is between those who would see that as eroding the general principle that actuaries should have a good general education, and those who adopt more the line that Mr Ryan put forward, which is that there are certain areas of the profession that need a very much more specialist education process.

I hope that we have a reasonable compromise here, by reducing the amount of content in the individual subject areas that correspond to the current subjects E to H, and pushing up into the final Fellowship Stage much more detailed material which is specialist to that area. That gives the scope to bring in more material for particular specialisms. It leaves open the possibility of developing additional advanced certificates, such as we have already done in the derivatives area. It could be done in the general insurance area as well, and also practising certificates for those who are taking particular roles in the statutory or quasi-statutory sense.

We also have to bear in mind, very firmly, that one of the driving forces for this review was the wider fields and the challenge of equipping people to move into wholly new areas. Therefore, we do not want to tie people down to too much detailed specialism at the FIA level, which would then inhibit them from moving into a new field.

International developments are pertinent to our discussion. The Groupe Consultatif agreed a core syllabus requirement at its meeting in October 1996, which is not very far removed from the proposal within our present strategy. This is not surprising, since it was very much influenced by U.K. involvement in the process. Continental European actuaries would certainly not recognise that actuaries should be specialists in terms of basic training, and, generally speaking, they are much in favour of the idea that actuaries should cover the whole range. Therefore, the proposals insist on actuaries having a good level of knowledge in each of the areas that I have mentioned. In fact, the syllabus, as drafted by the Groupe Consultatif, has health insurance as a separate obligatory area, although that covers some areas which are currently within our syllabus in the life insurance and general insurance fields.

The International Forum of Actuarial Associations also has an education sub-committee addressing the question of a common core syllabus at a global level; that brings in the Australians, Americans,

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Japanese, and so on, and they are likely to begin by setting a level significantly lower than that of the Groupe Consultatif. The Groupe Consultatif is concerned with mutual recognition within Europe, and people moving at fully qualified levels, whereas the IFAA, at least initially, is thinking of something more akin to an associate level of mutual recognition. They are almost certain to require the sort of mathematics that we are envisaging in our strategy. Mention has already been made of the modelling component of the proposed IFAA syllabus.

They are also likely to go down the same route as the Groupe Consultatif in terms of requiring some basic general knowledge for all actuaries in all the practice areas. This is going to require some changes for the American societies: the Society of Actuaries and the Casualty Actuarial Society, which, up to now, have had a greater degree of specialisation. The Society of Actuaries is already engaged in its own review. We need to watch what it is doing. One of the most important things that it is doing is in the generalised modelling field. Others have referred to this already. The subject will be examined through an intensive seminar rather than through an additional paper, and it is very important that we watch their modelling seminar to see whether we can learn something there and from the point of view of developing the wider fields, which is the motivation for introducing this. We need to ensure that we have something similar within our generalised modelling approaches, rather than focusing too tightly on the traditional areas of our syllabus.

We have specialisation about right in these latest proposals, but we may have to acknowledge the need for greater specialisation through advanced level qualifications.

3. *Assessment, Qualifications and CPD*

Mr R. W. Steel, A.I.A.: This meeting has taken place several times before, because this is the fourth time that I have been to a meeting to discuss this paper. The debate on this paper has evolved over the past three months since it appeared. One question that has been answered has been the students' view of the length of the qualification period. Current students and students studying at universities for actuarial qualifications have said that they would rather sit five hours of examinations to cover 100% of the syllabus than three hours of examinations covering the 60% chosen by the Board of Examiners for that particular occasion. The objection to this is not from the students, it is from the organisers who need more examiners to look at the longer exams, more rooms and more invigilators. As an Examinations Centre Supervisor, I am finding more reluctance among the Fellows whom I approach to become invigilators, than in the past. I gather from others that this is not uncommon. Perhaps the senior actuaries among you, who are also managers, should start to put back pressure onto your junior actuaries to take a more active role, instead of seemingly to put pressure on them to do so much in the way of work that they have not got time for it.

I understand that the Privy Council does not like the principle of a half-qualified actuary. Therefore, we should have a fully- qualified Fellow of the Society of Half Actuaries. Let us call it the Society of Actuarial Technicians. It is several years since I found that practically every other profession had its junior counterpart; and, as an example, I suggest doctors and nurses. It is time that the actuarial profession recognised the status of actuarial technicians and had its own junior profession.

Mr M. K. Lunnon, F.I.A.: I was interested by the proposals set out in the document for the different levels that might exist, given Privy Council approval. On considering these, I think that very few people from the U.K. would end up with the proposed Associateship level. If you could pass all four of the Application subjects and the Communication examinations, then to move on to qualify fully as a Fellow would be the next step, and would not present a great stumbling block for many people. This may be desirable in order to limit the number of people who are called Associates, but it means that there would be far more people who ended up with this diploma.

We also need to ensure that the Foundation subjects lead up to the Application subjects, and that there is not a great leap. This seems to be a problem at the moment, where the pass rates for subjects A to E seem to be quite high, whilst those for subjects F, G, and H and the Fellowship paper seem to be rather lower. In that respect, it could be argued that the early subjects are not fulfilling their purpose in preparing students to sit later subjects.

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What rights, if any, would having this Diploma in Actuarial Techniques grant, and how would this be brought together with the President's wish to expand the actuarial world to include those with skills in related areas? Those I have in mind are students who pass many, or all, of the Foundation subjects and either because they do not pass the later examinations or do not sit them because their work has taken them into just one area, end up with this partial qualification. They may well lose touch with the profession altogether, because it is no longer seen as being relevant, and membership is not cost effective. How can we keep in touch with those people as well as making this intermediate qualification attractive for others who would otherwise never have thought of coming into the Institute or the Faculty at all?

There is another possible level where a qualification might be worthwhile, and this fits in with some of the concerns of those working in general insurance. Might it be possible to find a qualification, and if the Associateship is redundant at the level set out in the paper and for the levels that I have explained, it might be sensible to give the Associateship for a different level, and this is a level for someone who has passed the Foundation subjects, has passed one or two Application subjects and, perhaps, the Communications examination, and has taken the Fellowship paper in the subject that is appropriate to the Foundation subjects that they have done. So, what they have missed out on is some of the Application subjects in some areas in which they are not working.

I also have concerns where we are looking at other international actuarial associations which may want to consider using the Foundation subjects and the Application subjects as in the U.K., but who then want to set their own Fellowship subject in order to deal with their own local situations. The Institute and the Faculty should offer them as much support as possible in doing this, particularly for some of the smaller and newer actuarial societies around the world. That might make the Foundation and the Application levels of the U.K. syllabus particularly attractive if we see ourselves as being in competition with other actuarial professional bodies from around the world.

The President, (Mr D. G. R. Ferguson, F.I.A.): Thank you for raising the penultimate point. One of the ideas that I floated in my Presidential Address was that we should have a qualification based upon the pillar structure. People who have completed the Foundation Stage and then have obtained the maximum qualification in, for example, general insurance, could then become fully qualified general insurance actuaries. We would reserve Fellowship for those who complete all the examinations, but a general insurance actuary would qualify for a practising certificate. The procedure would be similar for pensions actuaries, and so on.

I have not been to all the discussions of the strategy around the country, but I have discussed some of the ideas in my Address with members in Bristol, for example. There, an electronic voting system enabled all at that meeting to express their views, and there was overwhelming support for the idea which Mr Lunnon has just described.

Discussions in Birmingham and at other regional societies also suggest that his idea would command wide support, and would be more relevant than the Associateship for everything other than subject Q.

Mr P. D. G. Tompkins, F.I.A.: I support those endorsing the profession's move to put more rigour into the mathematics at the Foundation Stage of the examinations, but caution the profession that, by doing this, we are running the risk of restricting our entry to those with a mathematics background. This may result in a smaller profession long-term than our current levels. That, in turn, may mean, given the way in which, as a profession, our corpus of understanding is built up, that we achieve more.

The approach to specialisation in the paper is very appropriate, in particular the wish to continue to require people to study all subjects before specialising with the Final and Stage 3 approaches. In so much of what we do we have a need to understand other areas apart from our own. It may be only peripherally, but one of the values of the training which those of us who have been through it have experienced is that it gives us the all-round view of the way in which actuaries work and an understanding of finance in general, which would be a great shame to lose. I support the approach that at Stage 2 you have a module in each of the major subjects. That gives the opportunity, at future

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times, to add health, or whatever it might be, which might be best introduced at Stage 2 before it becomes one of the options which is examined at Stage 3. Nothing will stop actuaries developing other areas, but probably before we add that to the Stage 3 examination we probably would want to see it built into more of a solid form for examining at Stage 2.

So far as the structure of qualifications is concerned, we already have the Diploma in Actuarial Techniques, and the term 'actuarial technician', which some people would feel to be appropriate after the Foundation stage, requires us to talk about people as 'actuarial technicians'. Thus, those who have the Diploma in Actuarial Techniques should be able to adopt that title.

Concerning the Associateship and the Fellowship; I regret the fact that there is now no intermediate status. For accountants, those in pensions management and the Chartered Insurance Institute there are Associateships and Fellowships, that is an intermediate qualification. Why is the Privy Council so set against us doing this? The obvious place to have Associateship is before the third stage, QQ, but not before Stage 2 is completed. I also question when Fellowship qualification should follow.

One suggestion is to have the professionalism course permissible before taking Stage 3. That would be useful where people have, for example, fully developed themselves in their area of specialisation, taking on major responsibilities within their firms, short of being formally actuaries. It would be a good thing for some of these people, who have been 5 or 6 years in the profession, to be able to take professionalism courses before they have finished the qualification process. I also suggest that the Fellowship be dependent, not merely upon the completion of Stage 3, but also upon the completion of the professionalism course, and also, perhaps, dependent upon CPD.

The requirement for CPD to be completed is not mandatory for us as yet. One possibility would be to make the Fellowship a qualification which depended upon all the aspects that we have been discussing, so that a continuing up-to-date CPD record is required. This route could avoid much of the red tape that we are surrounding ourselves with now, as we move more and more into having practising certificates, a concept with which I have never had any sympathy, because it actually belittles the responsibility that we take upon ourselves as Fellows of this professional body, which is to be competent in what we are doing. If we had a system whereby the Fellowship was dependent upon being fully professionally qualified and up-to-date in one's work, we could dispense with much of the paraphernalia that is growing upon us of having to have certification for doing what we should be able to do, given the Fellowship that we have already obtained.

Mr M. R. Kipling, F.I.A.: As a member of the Education and CPD Board, I am enthusiastically behind these proposals. I draw your attention specifically to their evolutionary nature. They do not move us too far away from where we are now, but when they have finished moving this time, the move after will already be under consideration.

There seems to be some resistance to the idea of an examination process which is constantly evolving. There was a time when the examinations syllabus was reviewed every 10 years. More recently it has come to every 5 years. As happens at universities and for other forms of examination, we ought to be getting used to a situation where the syllabus is constantly under review, so that the most modern techniques are always being taught to our young actuaries.

The resistance comes both from students and from the examiners. Students have come to anticipate taking a long time to qualify and failing a number of examinations on the way. This means that there is a natural desire to be reasonably clear, reasonably confident, about what is going to have to be achieved to get all the way to that final hurdle. To keep the syllabus constantly changing also adds significantly to the already stretched demands on the Board of Examiners.

One way round this is to see what can be done to tackle the problem of why qualification takes so long. The Education Committee recently had a presentation from the Institute of Chartered Accountants in Scotland, at which they described their examination process. Their ratio of students to qualified Fellows is far smaller than ours, and, on average, most of their students qualify within 2 years of entry. In fact, they get only 2 years to qualify. They normally come with a university qualification in accountancy. They have two sets of examinations, equivalent, perhaps, to the Application Stage and the Fellowship Stage. They have to pass all the examinations at each stage in one go. They essentially have only one, or at most two, chances to resit them. They have a number

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of different approaches, both to the style of the examinations and the tuition methods, including intense full-time coaching for several weeks before the examinations.

The net result is a far smaller proportion of the profession involved in the actual mechanics of the examination process, with more being able to be involved in pushing the process forward and developing it, considering new examination techniques, and so on. Also, students expect that it does not matter what happens to the syllabus in two years' time, because the vast majority will be qualified by then. It also means that an interim qualification is not needed, because there will not be the high drop-out, the large number of people who we have who are left over as half-actuaries.

Thus, there is much more that we can do, when the current proposals are in place, to look at other ways of improving them. One suggestion might be, at the Application Stage, to look at whether we can teach more and give some choice on what we actually examine. In the current proposals there will be some difficulty in cramming all those extras listed under health care, and so on, into either life or general insurance and still examine comprehensively. I can sympathise with the students who say that they would like the examiners to examine 100% of everything and take 5 hours. I prefer the examination papers to ask questions ranging across the whole syllabus, but we accepted that nobody could answer everything, and let them have a little choice. If students can answer questions on 60% of the subject matter, and we can be reasonably sure that they have studied the other 40%, we can be content that we have lived up to the standards of other professions. What is more, the standards of our own profession will not have deteriorated. After all, how many of us, even two or three years after qualification, can really say that we recall much about topics in which we are not actively practising?

The evolutionary process could take us to a much wider syllabus. There is no reason why external modules on subjects such as marketing, management, law, or accountancy, could not be appropriate substitutes at the Fellowship Stage for some of the subjects taught by ourselves. This would take some stress off our own examiners, while giving our newly-qualified Fellows a wider base. Similarly, at the earlier end, there could be more use of universities. The President's initiative to encourage more universities to teach actuarial science, either as a course or at least as part of a mathematics course, is greatly to be encouraged. That would free more of our amateur educators to concentrate on the central, most important, actuarial practice part of education. Taken together, all these proposals would give us an education process that I could be very happy with, if we could evolve to it in due course.

Mr J. Goford, F.I.A.: Should the Faculty and the Institute be prepared to grant exemptions at the Application Stage to students who have successfully completed relevant university courses? Initially, my reaction was 'no'; but, on reflection, I think that it would be one of the useful ways of helping the *rapprochement* with the universities. The problem always is how do you also get some practical experience? There is some presumption that, if people have a full-time job at the same time, then they are picking up some practical experience.

On the issue raised by Mr Tompkins, I think that certification is a necessary evil for the demonstration of competence to those in the outside world. They seem to appreciate it. CPD has not yet been much discussed, but it is also a crucial part of the demonstration of competence. Professionals know that they have to keep themselves up to date, and I hope that we continue to reinforce the personal responsibility by recording the demonstration of keeping up to date.

I should like to see a compressed MBA. Actuaries who have gone through all their examinations are well able to pick up things extremely quickly, and could well do with the rudiments of an MBA course geared specifically to them and their occupations.

I am interested on our thoughts on the Communication paper, as it has been a hurdle, whether it might be better put at the beginning of the Application Stage, after the Foundation Stage, rather than at the end. Thus, I put the question to you: those in support of putting the communications paper at the beginning of the Application Stage, after the Foundation Stage, on the grounds that there is enough in the Foundation Stage to test communications, please indicate... Those who think that the communications paper should stay at the end of the Application Stage, please indicate... I think that the result is about 50:50!

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Mr R. E. Snelson, F.I.A.: I also wish to consider the Communication paper. When I started taking examinations, there was a preliminary examination of four papers, algebra, calculus, précis and essay. At that time, as the examinations progressed the pass ratios increased, so one felt some consolation that, although, perhaps, there was only a 30% chance of getting through Part 1, in the later stages of the examinations the pass rates were between 50% and 60%. Today the reverse is the case. If the Communication paper came further forward, some of the people who have trouble with those subjects would be eliminated sooner. Therefore, I agree with the particular motion just put to the meeting.

Mention has been made about high jumps and not raising the bar, others have considered hurdles, which is much more like it. I note that the new proposals give us 16 papers instead of 18. However, there are more examinations to pass, and we have increased the number of hurdles. Furthermore, if we are going to continue to review the system, then we are going to raise the height of the hurdles and move the distances between them whilst the students are still running round. That does not seem to be very good.

Professor A. D. Wilkie, F.F.A., F.I.A.: I suggest that the Education and CPD Board looks carefully, once the syllabus has gelled, at what the higher mathematical requirements are. With the higher level of mathematics in this syllabus, we are requiring people to know an awful lot before they come in.

In order to become an actuary you do not need a mathematics degree, but you need to be the sort of person who could have got one if you had tried. It is not the knowledge, it is the ability. I presume that there is not a lot, even in the stochastic processes paper, that involves much more than straightforward calculus and a little matrix algebra, and enough to demonstrate an understating of various theorems, etc.

Concerning Mr Green's contribution, if he was talking about the efficient market hypothesis, then he has not read any of my papers for the last 16 years. My model is totally in conflict with the random walk model of efficient markets. I hope that something like this will be in the syllabus for financial economics. He also has not looked at the syllabus for the Advanced Certificate in Derivatives, which certainly teaches the Black-Scholes model as one aspect of it. Mr Kemp's paper (*B.A.J.* 3, 51-180) and Mr Smith's supplementaries also discuss alternatives and ways of adjusting the Black-Scholes model. There is confusion in some people's minds between the Markowitz portfolio selection model and the capital asset pricing model (CAPM), which are two quite different things, about as different as the concept of a select mortality table on the one hand and the de Moivre straight line for l_x on the other.

Mr S. J. Green, F.I.A.: CPD is important, but more important is learning on the job. We should restrict Fellowship to people who have at least two years' employment in the area in which they have taken the relevant paper at the advanced level. Before we emphasise CPD we should place more emphasis on experience.

Investment is an extremely difficult subject, and, therefore, we should not have actuaries talking about investment who have no direct experience of it. No actuary should teach any subject of which he or she does not have practical experience. Going to conferences or reading books is not the same as working in an office and learning first hand.

Mr J. F. Hylands, F.F.A. (closing the discussion)**:** Your input has been invaluable. I am not going to attempt to summarise all the contributions, but to comment on one or two of the points that have been made, and to state the current position from the point of view of the Education and CPD Board on the questions posed in the paper.

Mr Dumbreck said that we must get this right and Mr Kipling said that evolution is a continuous process. I agree. We are not approaching the end of a process where we will 'nail' this down and then enjoy an extended period of stability, but as soon as we have got to the end of this phase, another phase will begin. We have the opportunity here to build the education system that will take the profession into the next century. It is vital that we get this right.

Concerning the questions that were discussed, most time was spent on the first two questions: should we be strengthening the mathematical and statistical content; and is it right to emphasise the

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role of models? As the discussion proceeded I put down ticks and crosses, and I ended up with many ticks, two crosses and one question mark.

This seems to be a pretty satisfactory outcome from the point of view of the Education and CPD Board, that our proposals do not have unanimous support, but certainly do have wide support within the profession. I take the point made by Professor Wilkie that we must have enough, but not too much, mathematics in the syllabus. The point was made a little later that this must be the right mathematics. We are acutely aware of the need to get this balance right between laying appropriate foundations and providing the actuary of the future with the right tool kit, a balance between that and the necessary degree of pragmatism and attracting the right people to the profession and providing them with the right equipment.

I also take the points that were made about the use of models, understanding their applicability and their limitations, and the extent to which an understanding of the derivations, the assumptions, that are used, the way in which the models are built and developed, helps the actuary — as a professional rather than as a mere manipulator of figures — to use models intelligently. Here, too, we have to be aware, as Mr Daykin has mentioned, of the U.S. developments, with their intensive modelling seminar as a means of developing their students' understanding in this area.

The issue of students with non-mathematical degree subjects coming into the profession is something that we have to take note of. Much of the richness of the actuarial profession, at present, comes from our broad entry base. We have never recruited from a narrow base. It would be a great pity if that were changed. As Professor Wilkie mentioned, the extent of mathematics required is not that great. What is needed is not prior mathematical training, but rather mathematical ability. Therefore, I hope that the profession will be able to continue recruiting from a wide base of skills and a range of disciplines.

Is it appropriate to leave the entry requirements unchanged? The last bastion of school leavers entering the profession directly, which was in Ireland, has now changed, and, as far as I know, we have what is now very close to being an all graduate entry to the profession. We are not proposing, in this strategy, to alter our formal entrance qualifications.

Moving to the Application and Fellowship Stages, the proposed approach to specialisation is the area in which we have seen the greatest divergence of views between those who consider that we should be going further down the specialist route and those who consider that we have the balance right. Nobody argued strongly that we had gone too far towards specialisation. This is an area where evolution will continue. I think that, at the moment, we have the balance about right, but it is likely, as things evolve, that we will find the investment and the general insurance areas, and also, perhaps, in the future, other areas in need of specialisation. Mr Ryan's suggestions on the various options that might be available, the various routes to qualification as an actuary, merit serious consideration. Mr Daykin summed up the position of the Education and CPD Board. In this particular strategy review we have gone a sensible way down the specialisation route, and we should not push too far too fast.

Is it appropriate to concentrate on principles at Stage 2 and assess country-specific practice and legislation at Stage 3? Those who alluded to this seemed happy with the proposal. We are currently still developing the syllabuses. Until we have finished these it is not clear that we shall be able to deliver this objective. It is laudable to say that in Stage 2 we concentrate on principles, but they have to be taught and examined in a context. The hope is that we can provide enough of a context to allow students to demonstrate an understanding of the principles without having to absorb much detailed legislation. We need some more time on syllabus development to be confident that we can actually achieve this.

Should further Fellowship subjects be introduced, and if so in which areas? We have already referred to the need for development, particularly in investment, but so far as the Fellowship subjects go, you did not have any specific comment. It is an area which remains for further evolution in the future.

Turning to assessments, qualifications and CPD, should assessment methods other than closed book examinations be used? Mr Kipling referred to the extremely interesting presentation that we had at the Education Committee from the Institute of Chartered Accountants in Scotland, who have an approach to their professional examinations based on an extensive use of case studies. It appears to be the ideal

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method of testing professional communications skills, but this requires considerable resources and a close alignment of the tuition and the examining processes. We should move in that direction, but we need to move carefully and to make sure that we are getting it right. I hope that we can move towards open book examinations in the second part of the Fellowship examination as a step along this route.

The position in the Education and CPD Board concerning exemptions from the Application Stage for university students is that we ought to proceed with some caution here. The area which is probably most ready for this is the investment area. We are alive to the concern that people come through without relevant practical experience. We may be qualifying people as Fellows who are not fully equipped to work in our profession. So we are open here to reviewing this area, but we would like to proceed fairly cautiously.

Concerning communications skills, the view has been expressed that this paper should be brought forward, perhaps to the beginning. Again we need to review this area. It depends too on how we are examining at the Fellowship Stage. As we move towards open book examinations and, perhaps, in the fullness of time, to case studies, that is the area in which communication skills can be demonstrated in a real and practical sense, but the objective of determining at the outset that entrants to the profession have the potential to be effective communicators is something that we need to look at carefully.

There were several contributions on the topic of intermediate qualifications. We need to talk to the Privy Council about their views on this subject. We have a balance here between defining what an actuarial technician is, what an Associate is, and being careful that, in the public mind, there is clarity about what people with a particular intermediate qualification are capable of doing and what the profession is saying about their status *vis-à-vis* other members of the profession and *vis-à-vis* their clients. Again, here is an area where we have to do further work.

How can actuaries be encouraged to enhance their skills through CPD? I was encouraged here at the comments that were made that developing CPD must be the personal responsibility of individual actuaries. Although for those who require practising certificates we have 'sticks', for most actuaries we ought to have the 'carrot' of making it very clear that proper attention to professional development is a personal responsibility and is essential for a rewarding career, especially as, in the future, it will be more and more necessary for members of the profession to demonstrate their adaptability and their ability to move into other fields.

It is appropriate that we equip actuaries, pre-qualification, with the right basic tool kit, and then provide them with, and encourage them to avail themselves of, appropriate CPD. That will equip them to move from one area to another.

This discussion has been very useful. We will study the transcript of the discussion carefully, and make sure, in moving forward, that we take into account the views expressed here, along with views that will be expressed at the forthcoming Faculty meeting and the views that have been expressed in written responses to the consultation and in the various consultation meetings that have taken place in actuarial societies around the country. We are determined to get this review right, and to build a robust foundation on which the profession can move forward as the leading profession in the field of finance, not just in the U.K., but worldwide.

The President (Mr D. G. R. Ferguson, F.I.A.): The fact that we do care as much as we do about the future of the profession and the future examination of those who have not yet qualified is evidence of a healthy profession. It is unfortunate that this discussion comes just before the examinations, so that we have not had as many students participating as we might have done. However, some very useful points have been made, and I am grateful to all who have contributed.

I am particularly grateful to all who have participated in the evolution of the examination and education strategy this far, both on the full-time staff of the Institute and the Faculty and also the Education and CPD Board and the Education Committee. I particularly ask you to join me in thanking both Mr Dumbreck and Mr Hylands for this meeting, and for all the work that is going to be involved in the implementation of the new strategy.

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ABSTRACT OF THE DISCUSSION

HELD BY THE FACULTY OF ACTUARIES

The President (Mr P. H. Grace, F.F.A.): Against the background of the paper, 'The Future of the Profession' (*B.A.J.* **2**, 325–427), and the development of core syllabuses by both the Groupe Consultatif and the International Federation of Actuarial Associations (IFAA), the Councils of the Faculty and of the Institute instructed the Education and CPD (ECPD) Board to carry out a strategic review of the profession's education system.

The Board's preliminary report was discussed at a joint Council meeting in September 1996. A subsequent revised report was distributed to members in November 1996. Many of you will have already made written comments, but this is the opportunity for us to have an open discussion on the proposals.

Mr N. J. Dumbreck, F.I.A. (introducing the paper)**:** This is one of the last opportunities to discuss the proposed new education strategy before decisions are taken on the way forward. During the consultation process, so far, we have observed quite a wide spread of views within the actuarial profession on a number of the main themes of the proposals, and this has ensured a healthy debate. While the final proposals are unlikely to please everybody, they will certainly be the product of thorough and detailed consideration of the educational needs of actuaries in the early years of the next millennium.

The current review was brought about partly in response to *The Future of the Profession* report, and partly to a feeling that some aspects of the current system, which has now been in place for three and a half years, were not working as well as had been hoped.

The main weaknesses are perceived to be: first, that the syllabus does little to prepare actuaries to work and to add value outside our traditional areas of activity; and second, that in order to qualify under the current system, a student is expected to learn almost as much detail about the practice areas in which he or she is not expecting to work as about his or her own chosen practice area.

These two areas of weakness are not entirely unconnected. There is a growing suspicion that the inordinate length of the tuition courses for some of the later subjects is partly responsible for the low pass rates in those subjects. Students have little time to do anything other than to learn a large number of facts, and so are sometimes unable to demonstrate the level of understanding for which the examiners are looking. Greater emphasis on understanding, and building on the underlying principles, would, I believe, produce actuaries who were better able to adapt themselves, both to new developments within traditional areas, and to work in wider fields.

It would be wrong to suggest that the problem of over-long tuition courses results solely from the degree of detail in the current syllabuses for Subjects F, G and H. It is also a consequence of the tendency of the profession's main tuition provider to want to spoon feed students rather than encouraging them to think for themselves. However, we are unlikely to succeed in reorientating the education process towards teaching principles and problem solving, rather than facts, without making fundamental changes to the syllabus.

The most significant features of the proposed new education strategy are the wider range of mathematical techniques in the Foundation Stage and the greater degree of specialisation at the Application and Fellowship Stages. There has been a lot of support so far for both of these developments, but neither is without controversy.

Dealing first with the Foundation Stage, there is concern that the inclusion of more difficult mathematics in the syllabus will discourage the more commercially-minded graduates and those without a strong mathematical background from entering the actuarial profession, and that this is too high a price to pay for introducing techniques which may only be used by a small minority of actuaries. The ECPD Board has been very conscious of this risk, and has no desire to introduce material which is of a highly specialist nature and could better be included in a post-qualification Advanced Certificate aimed only at those who need it.

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On the other hand, there is a serious risk that the actuarial profession will continue to lose ground in some of its core areas of activity, and will struggle to expand into new areas, unless practitioners are equipped with up-to-date techniques of modelling and a reasonable understanding of financial economics. To quote from the recent report of the Society of Actuaries Education Task Force: "The mathematical rigor applied to practical problem solving is what makes the actuary unique."

As usual, it is a question of getting the right balance rather than aiming for extremes. The Board is fully in agreement with those who argue that we should teach actuaries to view models with an appropriate degree of scepticism rather than following them blindly, and it is proposed to modify both the name and the content of the new Subject 5 to recognise this.

On the issue of specialisation, there are some who believe that the proposed structure at the Application and Fellowship Stages will cause difficulties for actuaries whose work spans two or more practice areas or who wish to change disciplines, and some who think that it does not go nearly far enough in the direction of increased specialisation. The most vociferous arguments, so far, have come from a few members of the General Insurance Board who are worried that we will lose out to other professions if we continue to require those wishing to pursue a career in general insurance to spend a lot of time learning about life assurance and pensions. This is a valid concern, which will strengthen our resolve to keep detail out of the Application Stage.

It is never going to be possible to teach students all that they need to know in order to practice in a particular area before they qualify, and there is surely merit in a broadly-based syllabus, which enables students to compare techniques and practices across different disciplines. Nevertheless, it would not be surprising if the next major syllabus review proposed a further degree of specialisation.

As the President has said, there are a number of parallel developments in actuarial education internationally, including the Society of Actuaries Task Force and the work on developing common syllabus elements being undertaken by the IFAA and the Groupe Consultatif. There are some common themes, including specialisation and preparing actuaries for wider fields, and it seems to be generally recognised that principles are more durable than current practice, and that the education process should emphasise modelling and problem solving. I am not aware of any aspects of the Faculty and Institute proposals which would take us in an entirely different direction from the rest of the world.

The agenda paper for this meeting lists 15 specific questions on which the ECPD Board would welcome your views. I have covered only a few of these in my introduction, but hope that the discussion will touch on all of them.

1. *The Foundation Stage*

Dr W. F. Scott, F.F.A.: I am a little concerned about the inclusion of difficult mathematics. I feel particularly uneasy about including stochastic processes before the traditional actuarial areas, or what is left of them.

You could say that life contingencies appear to be more or less cut to the bone. I notice that non-profit policies do not appear at all, which is a bit strange for an actuarial profession; Subject 8 begins with with-profits policies. The proposal, overall, is going far too far in an academic direction. I work at a university, but I still hold this view. I should like far less change, and believe that life contingencies should stay as the central subject of the actuarial profession, and not be shunted into a minor sub-set of something else.

Much of the proposed mathematics is too difficult for the lecturers, let alone the students. Some of it will probably be done non-rigorously, and therefore badly.

Professor A. D. Wilkie, F.F.A., F.I.A.: I ask Mr Dumbreck what he meant by saying that both the name and the content of new Subject 5 were to be modified.

Mr Dumbreck: I understand that the current intention is to call Subject 5 'Actuarial Modelling' rather than 'Stochastic Processes'. It is not intended to make it significantly less stochastic, but it will be given a more practical feel. In its amended form, the subject will cover the general aspects of model building and the use and abuse of models, as well as the necessary mathematical techniques.

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Professor Wilkie: I do not see that 'Actuarial Modelling', as opposed to 'Stochastic Processes', is any different from any other sort of modelling, so long as the content is the same as the working party have been considering. The content is a bit on modelling, but not a huge amount, a bit on simulation and mostly on stochastic processes. One of the dangers is that, if you talk about stochastic modelling you might be dealing with statistical models which are not time dependent, and are not, therefore, in a sense, stochastic processes. Statistics appear in Subject 1 anyway.

The syllabus ought to include discrete space and continuous space processes and discrete time and continuous time processes. There are many examples, like NCD systems in motor insurance, life tables, multiple state and PHI models, pension fund service tables, marriage tables, Poisson processes used in risk theory, and time series models like the Wilkie stochastic model. There are also continuous models, like Brownian motion, which are necessary for Subject 9, and option pricing theory in 'Financial Economics'.

It is very important that the structure of the mathematics should be made simple. Dr Scott is a purist in this respect, and I know that he does not like non-rigorous proofs, but most of us are perfectly happy with non-rigorous explanations that seem plausible and will satisfy our requirements, so long as people know what the results are. We need to be careful about precisely what mathematics we include.

In stochastic processes the mathematics do not need to be difficult at all. We need no more than straightforward calculus, (the sort of special extensions of calculus, that come in the Ito processes, but can be explained straightforwardly without bringing in the depths of measure theory), and some knowledge of matrices. It is not terribly difficult if it is properly explained.

If you read the wrong textbooks on the subject, many of you will find yourselves in the same position as I was, many years ago, when I picked up the first book that I could find on stochastic integrals. It said, "It is presumed that the reader is familiar with...", and at that point I stopped understanding! We need to make it so straightforward in its presentation that anybody with A level mathematics can understand. That is not an easy task.

One thing that concerns me with both the two new subjects, Subjects 5 and 9, is the difficulty of getting satisfactory reading, or finding anybody who will be able to prepare the reading. I think that the timetable is far too optimistic, and that it needs to be postponed by a year for those subjects. There is no way in which we are going to get satisfactory reading by January 1998. We could get quite unsatisfactory reading, but it would be better to start the examinations on the right footing rather than on the wrong footing, and then change them a couple of years later.

Mr J. Goford, F.I.A.: I welcome the introduction of model building as part of Subject 5.

There is one more piece of the jigsaw which may be worth putting in. It is that, if we are going to introduce model building and encourage actuaries to grasp models and see how they can use them, then, not only do we want to avoid the full rigorous proof, as Professor Wilkie suggests, and concentrate on some non-rigorous proofs, but some 'experiential' learning also should be put in. By this, I mean that you take the model and see if it works without even looking through a proof at all, and see whether it, *prima facie*, produces results that you want to use. Such an addition would be well worthwhile, and might provide the final bridge between the theory of model building and the proof behind the model itself.

Professor R. S. Clarkson, F.F.A.: Mr Dumbreck said that one of the priorities is to prepare actuaries for wider fields. Under Subject 8, we have with-profits business, unit-linked business, and pension funds. As Dr Scott pointed out, non-profit business seems to have disappeared. However, a common link through all of these is the investment function; but, where is the investment function brought in? The suggestion is through financial economics. My views on the limitations of financial economics are probably well enough known not to need repetition here, but I quote from Professor Pepper's written contribution to the discussion of my paper (Clarkson, 1996): "there is a tendency to build layer upon layer of complication on top of basic assumptions that are approximations. The result is an inverted pyramid on top of dubious foundations. As an intellectual exercise it may be very clever, but it has lost touch with reality. The academics would do much better to re-examine the foundations, secure them, and rebuild the pyramid".

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Professor Pepper's view and my view are only two out of the actuarial profession. However, the suggestion that I should like to make is that, rather than bring in financial economics through the back door without proper discussion at working parties, we should follow the precedent of the Wilkie model. Professor Wilkie's stochastic investment model was discussed, first, at the Faculty, and then, some years later, a review group was set up to report to the Institute. On the review group there were various practitioners, such as Mr S.J. Green and myself, as well as statisticians and financial economists.

If, after due consideration by a balanced review group, it is thought that financial economics is the best way forward, then by all means bring it in; but let us ask ourselves whether it is the relevant mathematics for the next century. As regards the investment function, investment analysis, as taught by classic textbooks such as Graham & Dodd (1934), might be a more useful addition. I am not against the teaching of financial economics if the serious limitations of the theories, particularly as regards risk methodologies, are pointed out; but let us think carefully before bringing them in through the back door.

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Professor Wilkie: I am in favour of bringing in financial economics. When I said that we needed the right kind of reading, I meant that, to my mind, the standard popular textbooks on the subject are mostly unsatisfactory. In some of them the mathematics is too difficult and others are too long. Yet other books that have been around for a while are American based, with far too much empirical description of the American scene. They teach, almost universally, that the risk-free asset is United States Treasury bills, whoever you are and from whatever country you are, and in that respect they have simply got it wrong. The capital asset pricing model and others like that are not appropriate as world-wide models, something which needs to be explained in the syllabus. On the other hand, the portfolio selection model for the individual investor is sensible. There are several reasonable textbooks about, but I think that the best one is out of print.

The mathematics does not need to be excessively difficult. There is no need to have a review body. Much of the content has been available in the literature and been discussed for a great many years. It is surely time to get on and teach actuaries the basics of the subject.

If people want to learn about investment management and investment analysis, then they have probably joined the wrong profession. It is the Institute for Investment Management and Research (IIMR) which runs those sort of examinations. If people are extremely keen to become investment analysts, then the answer nowadays is to become one and not to try to become an actuary. They are no longer the same profession. The subjects used to be in the actuarial syllabus, because the IIMR, or the Society of Investment Analysts, as it was, did not exist 30 or 40 years ago. Thus, there is no good reason for including it nowadays, just as we do not have very much about life assurance underwriting in the syllabus as we used to.

Dr M. R. Hardy, F.I.A.: Mr Dumbreck, in his introduction, seemed to believe that to be more mathematical somehow implied that one was less commercial. My experience is that the best students, (and there are a number of very good students) are both mathematical and commercial, and are deeply interested in both sides of problems. If we can continue to attract such people to the profession, then we will do well. Strengthening the mathematical content will not discourage such people. It may even encourage them to come into our profession rather than, perhaps, going into the pure finance side.

Concerning the title of Subject 5, which may be called 'Actuarial Modelling' or, perhaps, 'Stochastic Modelling' or 'Stochastic Processes', I am disturbed by the idea that we are appropriating this material as somehow specifically actuarial. I prefer the title 'Stochastic Processes', as it gives the clear message that this is a subject that is studied elsewhere. There are ideas coming in from

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probabilists and statisticians, and one of the things that would benefit actuarial education is a greater appreciation of the contribution made from other fields.

Mr C. D. Daykin, C.B., F.I.A.: I do not disagree with what Dr Hardy has just said. I think that the concept of broadening Subject 5 was based on the idea that we do not only want stochastic processes, but other types of actuarial modelling. We need to keep an eye on what is going on on the other side of the Atlantic. The Society of Actuaries has introduced a new part of their syllabus entitled 'Actuarial Modelling', specifically with a view to the wider fields. This fits in with something that Professor Clarkson said. Much of the impetus for making changes to the syllabus this time, relatively quickly after introducing the existing syllabus, came from a desire to expand the opportunities for actuaries to move into the wider fields, by giving them a broader-based education.

The Society of Actuaries is introducing actuarial modelling as a non-examinable module, which is taught through an intensive seminar. The students have to attend the seminar and carry out practical modelling work under the guidance of tutors, including practising actuaries, who will give them case study material to work on. So, Subject 5 is a compromise between the desire to introduce sufficient stochastic modelling to support knowledge about financial economics and derivative pricing, and also the need to broaden students' understanding of modelling away from a restrictive approach based on life contingencies.

That brings me to Dr Scott's remarks that we are diluting the emphasis on life contingencies. Yes, in a way we are. We cannot add many extra things without taking something out. However, the essence will still be there. Non-profit contracts are still there, but they are in Subject 7, not Subject 8, where all the basic principles of annuities and assurance products are introduced. Subject 8 introduces more advanced actuarial mathematics involving new principles, such as unit-linked and with-profits business. Investment is in Subject 10.

Financial economics, as envisaged in Subject 9, does not necessarily mean teaching capital asset pricing models and discredited theories of financial economics which were around 20 or 30 years ago. It does mean preparing actuaries to deal with derivatives, which is a topic of great interest for the financial markets, and which actuaries need to know something about. It involves quite a lot of technical knowledge in order to make much sense of them. Other important topics, such as immunisation, asset/liability modelling, hedging and other investment issues require appropriate mathematics to deal with them.

I now consider the question of whether we are increasing the level of mathematics unreasonably. We market ourselves as the profession which, in the words of a recent circular, makes financial sense of the future. It has also been described as the profession which deals with the management of uncertainty. If we are not able, as such a profession, to deal with statistics and stochastic processes, I wonder what value we are expecting to add for our clients and our employers, as compared to other people who are pensions advisers or insurance people without those abilities.

The distinctiveness of the actuarial profession is that we combine mathematical knowledge with practical skills of application and problem solving. It is absolutely essential that we keep up with the mathematics which is needed in order to continue to add value in that way.

Mr C. A. Speed, F.F.A.: I welcome the planned changes. They are long overdue. I can clearly remember why I decided to follow the actuarial route; it was because I wanted to use the mathematics that I had learnt, and the actuarial profession presented itself to me as using mathematics in dealing with managing financial risk.

If we are looking at risk, we are looking at uncertainty and we are dealing with the idea of probability. Probability, over time, is basically a stochastic process. I was astounded when I looked back, after qualifying and having no more examinations to do, that my actuarial toolkit was really quite poor. I did not have many of the skills that I thought I should have had.

Financial economics has been mentioned a lot. The use of derivatives is a classic example of something which is used to manage risk. I did not have the skills to fully understand what was going on, so I very much welcome the introduction of stochastic processes and financial economics. In particular, I think that we ought to keep the word 'stochastic'. It may not be a word with which we

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are familiar, but it is widely understood beyond our profession. Let us admit that we have not paid enough attention to stochastic processes. We should bring these in because they are of use in progressing the skill base of the profession. Do we look backwards and aim to retrench to the traditional skills of the profession, or do we use the highly qualified and very skilled people who are continually attracted to this profession, and allow them to have the skills and the tools to go forward and take actuarial knowledge into wider fields? I hope that it is the latter.

Mr A. T. Adams, A.I.A.: As a financial economist, I am pleased that financial economics has been introduced, although I am nervous that the capital asset pricing model has been described as being around 20 or 30 years old and now discredited. That is an extreme view, and should not be taken as being necessarily correct.

As things are now, it seems that market models and, in particular, the capital asset pricing model, are to be in Subject 2, which is far too early. Actuarial students should have reached a certain level of maturity before looking at models which are highly controversial. This should be within Subject 9. Any financial economist who looks at Subject 9 would find it bizarre that there is nothing about equities, which is something that has to be changed.

Mr Daykin said that you cannot put more material in the examinations without taking something out. However, the actuarial profession *has* been putting more and more in over the past 20 years without taking out very much. That trend is continuing, and at some point it has to stop.

Mr C. W. McLean, F.F.A.: I agree with Professor Clarkson's proposal that we include some basic investment analysis under financial economics. However, I do also believe that we should be trying to shorten the course and shorten qualification. It might be difficult to introduce this at the Foundation Stage without involving a lot of material.

I would be concerned if training actuaries in investment was left to another profession such as the IIMR. Currently, many Fellows are working in investment, even outside life offices. My own firm has three such actuaries. Regulatory requirements make it much less likely, in future, that actuaries and actuarial students can be switched into investment, unless actuarial education trains them adequately for this role. The investment business is becoming more professional, and the IIMR has raised its standards accordingly. If we do decide to leave this training to the IIMR, we will be left with a much smaller actuarial profession.

While the Foundation Stage does include financial mathematics, economics and financial economics, I believe that it misses some crucial investment tools. In particular, I think it is important to have some understanding of econometrics — recognising the extent to which much of the statistical modelling covered in Theme 1 may not produce valid results when applied to economic or stock market data. This is because of multi-collinearity, heteroscedasticity and autocorrelation. We may not need to teach econometrics, but we should at least teach students to recognise the limits of the linear model when applied to economic data. We are teaching statistical modelling, financial mathematics and financial economics, but not anything of economic statistics.

While there will be later training for those working as Scheme Actuaries, the statement of investment principles for pension funds does involve understanding risk and how that is handled in an investment process. I do not think that this is possible without a foundation in investment analysis, as risk and performance are closely interlinked in an investment process.

Dr A. S. Macdonald, F.F.A.: One aspect which is mentioned in the report, but which has not received any emphasis in this discussion is communication. We ought to remember that mathematics is a language, possibly the most universal language of all, and there are a great number of other numerate professionals out there — probably far more than there are actuaries — working in one of the traditional fields of actuarial science; that is, mortality and similar studies, and now in investments. Because of the rather narrow focus of the actuarial profession over the last 50 years, developments, by and large, have occurred elsewhere, and in a language that we do not speak. It is in order to communicate with other professionals and catch up with what has been done that we must

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learn, at least, some of the common language. Since we are small in numbers and they are large, we, in all humility, ought to think of learning the mathematical language spoken elsewhere.

This proposal is not about introducing more difficult mathematics; it is simply trying to give actuaries tools with which they can communicate with other numerate professionals.

Professor Clarkson: In response to Dr Macdonald's comment on communication, I shall begin by reading the last few sentences of Professor G. T. Pepper's written contribution to the discussion on my paper, 'Financial Economics — an Investment Actuary's Viewpoint' (*B.A.J.* **2**, 809–973): "Finally, ex-practitioners can be very helpful to academics, provided that there is communication between them. If I was a young academic, I would ruthlessly pick the brains of ex-practitioners and learn about the features of the real world that current theory cannot explain. I would concentrate on developing something new, and not on an endless extension of fashionable analysis." When the Wilkie model was first discussed at the Faculty ('A Stochastic Investment Model for Actuarial Use', *T.F.A.* **39**, 341–403), I pointed out that, having tried to use the Box-Jenkins linear time series methodology in the context of gilt-edged mathematics, I concluded, as a practitioner, that it was not robust enough for real world applications. By all means bring in new mathematics, but make sure that, within the profession, there is a safety mechanism of practitioners who may have 10, 20 or 30 years' experience, being able to say loudly and clearly: "Just a minute! I tried this 20 years ago. It does not work. How about adapting the theory in such and such a way, or at least putting out a health warning that the theory may not work in some circumstances?"

2. *The Application and Fellowship Stages*

Mr R. W. Baird (a Faculty student)**:** The proposal indicates that the communication paper would be set on an actuarial concept from the Foundation Stage or on the actuarial control cycle. The whole issue is to test communication. Currently, it is possible that a person could be faced with a question based on a subject that he or she had studied three or more years earlier. To answer a question clearly you have to know your subject well. In practice, you will only be called on to communicate in an area with which you are familiar. Is it not possible that communication could still be tested effectively, but with the question being based on the subject which the person is studying at the time, for example a question on investment, life insurance, general insurance or pensions? This will still test communication, but not have the disadvantage of a student facing a question on a subject studied at an earlier time.

Mr Goford: I support bringing the communication paper forward, maybe to between Subjects 9 and 10, or to between 10 and 11. I gather that, in the last set of papers, one of the communication questions was about APRs, which is a Foundation subject. I am sure that we could find sufficient things to ask about communication in the Foundation subjects — maybe the investment paper as well — and I think that it would help students get over that hurdle before they plunged into the final subjects. We took a straw poll at the Institute with a 50-50 result.

Mr P. D. Robertson, F.F.A.: Part of my employer's recruitment process is to put its prospective recruits through a paper very similar to the communication paper. Not only do I see a need to bring the communication paper forward, but to insert it before any actuarial exam. We are keen to avoid having people who are going to fall at the last hurdle.

Mr K. G. Telfer (a Faculty student)**:** On the communication paper, it is interesting to note that the intention is to examine only technical skills, and to leave non-technical skills to the employers of actuaries.

I regard communications skills as matters which an employer should be looking to train its staff in, or, more likely, to recruit its potential students based on their ability to communicate, at an appropriate level. Communication, perhaps, should not be examined at all.

Dr Hardy: I speak on one of the questions on the Application and Fellowship Stages: "Is it

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appropriate to concentrate on principles at Stage 2 and to assess country-specific practice and legislation only at Stage 3, as proposed?" I endorse this proposal wholeheartedly, largely as a result of my experience in teaching actuarial science in China.

We have encouraged the Chinese to take the actuarial examinations of the Institute, and I have taught some of the best mathematicians that I have ever met in these classes. I know that I have intense feelings of guilt that, after I have finished teaching them life contingencies, which they pick up extremely easily, they are going to need to come up with the details of GMP calculations, and of the difference between money purchase contracting out and final salary; and this in a country where the entire concept of the pension scheme is what they really ought to be picking up.

I appreciate the efforts that have been made to help developing countries to develop their actuarial professions and their insurance industries. I do not think that we are selling them a good product here, when we get them through the first six examinations and then say, "Okay, now we are going to hit you with the minutiae of U.K. insurance and pensions practice."

Professor Wilkie: Is the proposed approach to specialisation appropriate? Yes, at the moment, but as Mr Dumbreck said in his opening remarks, it seems that we are likely to need to move, in due course, towards greater specialisation. Coming from the Investment Committee side, I should like to see actuaries within the profession who know more about investment and investment theories as well as being practical investment management people. There is, however, much work in asset/liability modelling, in derivatives trading, and that sort of work for mathematically-minded people, whether they are actuaries or not.

I should like to see a concept of derivatives actuary in years to come. There is nobody qualified in that sort of position yet. In order to get people into the profession who have sufficient knowledge to be able, for example, to certify the appropriate parts in the balance sheet of a derivatives trader, there needs to be much specialisation in favour of investment for some people at the Fellowship Stage.

Comment has been made also about general insurance, which suggests that there needs to be greater specialisation in favour of general insurance for some people. Dr Hardy was quite right to point out that it is a pity to bring in the minutiae of U.K. legislation for overseas students at an elementary stage in the examinations; but I would feel rather uncomfortable if people were being given Appointed Actuary certificates who did not know anything about DTI Returns, or Pension Scheme Actuary certificates to those who had never heard of GMPs or MFRs.

So, we need the specialist U.K. training, training on U.K. legislation, on very specific actuarial work for life office and pensions actuaries. I do not see how we can do that without, in a few years' time, reorganising the syllabus with much more specialisation, possibly doing it through advanced certificates, so that you have to do an extra subject if you want to become an Appointed Actuary, or a Pension Scheme Actuary, or a 'Derivatives Actuary' or a 'General Insurance Actuary'. However, I would prefer that we moved towards the way of the Americans and the Australians, allowing students to get the Fellowship by doing 2 difficult subjects out of 5 rather than 4 easy and 1 difficult, as in this proposal.

Such a move is going to make the profession very different from what the Faculty was, even a few years ago, but less different from what the Institute is now. Other people's views would be helpful. Are we going in the right direction? Is this an appropriate step, is this a step in the right direction, and will we need to go further?

Mr C. W. F. Low, F.F.A.: Usually I am somebody who wants to keep the Faculty as it was, but, in Professor Wilkie's terminology, I would like it, on this occasion, to consider changing a bit more. I support very much what Dr Hardy said. I think that the way forward, particularly with the IFAA, is to build towards an international set of examinations.

I do not think that we need detail of life assurance and pensions or detail of any form of legislation in the Application Stage. I have a Scheme Actuary certificate, and I know something about the current legislation, but little of the last set of legislation had been dreamt of when I passed the pensions paper. Therefore, keeping up to date with legislation must be something found through CPD. We should

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keep the exams, therefore, to basic principles, enduring principles where possible, and developing principles.

I do not know as much as I would like to know about the Australian approach, but I have read something about it. I very much support consideration, in the Application Stage, of having a much more generalised approach which is multi-disciplined, which is what I think of as the Australian way. Then, within that, I suggest a paper on insurance and pensions which just asks generalised questions, which are quite international in nature. I would then bring in something about country-specific detail at the Fellowship Stage.

Mr Goford: The way I read it, and the way that I hope it is going to go, is that Subjects 10, 11, 12 and 13 are very much about principles and their applications, so that we have established a new framework in the Foundation Stage and then we come to principles in the Application Stage. These subjects display four ways in which the principles are applied; that is how they are applied for life assurance, for general insurance, for pensions and for investment. As far as possible, we are putting the detail back into the final subject.

The President (Mr P. H. Grace): Mr Goford suggested that we take a straw poll on where the communications aspect should come. There seem to be three possible timings: towards the end; somewhere during the Foundation Stage; or right up front, to establish whether or not people are able to communicate. [A vote by show of hands was taken.] I think the middle ground seems to have the most support. I hope that this is helpful to the ECPD Board.

3. *Assessment, Qualifications and CPD*

Mr G. M. Murray, C.B.E., F.F.A.: I would like to raise, for consideration by the Faculty, the question of partial qualifications and associateship. In the current education structure, and in the one being proposed, consideration could be given to following a route through the Application Stage on a particular specialist topic, assuming that the Australian control cycle is not being adopted, and that we are still using papers specific to life or pensions, etc. If a student took a specific specialist paper and followed straight on into the same subject Fellowship paper, then the student might be suitable for consideration by the Faculty as a partially qualified actuary — an Associate.

We would not have problems with the Royal Charter, provided that we were prepared to bring this group of partially qualified actuaries into membership. I feel, given the nature of the training, and given the way in which we have developed our disciplinary procedures, this would be perfectly sensible for the Faculty to consider.

Mr H. W. Raymond, F.F.A.: The question of intermediate qualifications is an interesting one. We have to bear in mind that there is a fundamental difference between the Faculty and the Institute on the treatment of students. Students are not members of the Faculty. Only Fellows are members of the Faculty — whereas in the Institute they have Fellows, Affiliates, Associates and students. All are members of the Institute, and so are subject to the Code of Conduct and the disciplinary scheme. As a result, students in the Faculty are not subject to the code of conduct and disciplinary scheme. The only sanction is that, if a student misbehaves sufficiently, the Council have a right to say, "We are not allowing you to carry on", and can make him or her withdraw completely. If we were to have an intermediate qualification, be it Associate or whatever, we would have to consider making them members, and, as a consequence, subject to the Code of Conduct and the disciplinary scheme, either wholly or partly, as it stands now.

I make another plea on a small aspect of this intermediary qualification. The paper proposes 'Associate' as a title. I do not think that the name is important, but I hope that, if we have an intermediate qualification of this kind, we can use the same name in both the Institute and the Faculty. The trouble with Associateship is it is already used in the Institute with a quite different meaning. We must try to find a common name in the two bodies for this qualification if we are going down this road, to avoid confusion both within and outside the profession.

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Mr Low: Commenting on assessment, I strongly support open-book examinations. It is not beyond the wit of the examiners to set sufficiently searching questions, where you have to be fully familiar with the type of documents that you are using as an aid, whether it be DTI valuation regulations, forms or guidance notes. It is like a real life situation, where you think that you know what it is all about, you know the general principles, but you want to check the minutiae before you go into print. The more we can get the Fellowship examinations to be like a real life situation, the more effective they will be.

Mr Telfer: Most students are more concerned about the method of assessment than about changes to the subject material, and, above all, they would like examinations to be more realistic. Whether examinations are open book or closed book, they certainly should be more realistic.

One problem with the present examinations is the pressure of time. No actuary in real life is subject to: "you have a question worth so many marks at 1.8 minutes per mark". We are all criticised for not structuring our scripts properly. In my view, it is not realistic to structure a report in the sort of time we have available in the examinations.

Another problem we find is that questions are generally ambiguous. Many students have come back from exams and said, "How did you interpret that question?" Actuaries also interpret the questions differently.

Then there are exemptions. People comment that exemptions are easy to obtain. For some subjects this could be the case, but it is certainly not true in many others. I think that it would be worth encouraging universities to teach subjects, but rather than have the universities set the examinations, make the students sit the official examinations.

The President (Mr P. H. Grace): I think that, at one time, university students doing an actuarial course leading to exemptions were required to do the Faculty examinations in parallel with the university exams.

Mr C. Thores (*a Faculty student*)**:** It seems to me that we are falling behind other professions. It takes so long to qualify that you are missing out on the management experience and post-qualification experience which other professions enjoy. Surely it is better to focus on experience after you have left university, or whatever, and then to go quickly into a specialist subject. Everything takes so long that it is easy to become jaded about the profession.

Professor J. J. McCutcheon, C.B.E., F.F.A.: I should like to clarify the position. Heriot-Watt University students never had to take the Faculty examinations. It was always accepted that, provided the university had external examiners of sufficient experience and standing, students whose work was of the required standard would be given exemptions.

Considering the comment on closed-book examinations, it seems to me that this has been construed as necessarily implying the adoption of open-book examinations. There are, however, other methods of examination which are not just 'open-book' ones. There are dangers with open-book examinations. I remember our recently-retired Principal at Heriot-Watt saying that they had this form of examination in the engineering faculty at Cambridge. Students would turn up with crates of books and would then fail the examination, because they spent so much time thumbing through the books trying to find the relevant references!

If students are told that they can take any material they want into the examination, there is a danger that some examiners will include an unacceptable level of detail in their questions, which is not what we want. I have no objection to open-book examinations, but I do not think that the examiners should see these as a licence to go 'over the top'.

On the question of other methods of assessment, it was noted that the Society of Actuaries has a module which is non-examinable (in the sense of a traditional examination), but is tested by some form of supervised project work. That would be acceptable, and is to be encouraged, but only provided that the necessary quality control can be put in. Can you be sure that the work you are assessing is, indeed, the work of the person who purports to have written it? That may be quite a difficult matter!

In a small profession likes ours, the demands in assessing project work, if it is to be at all

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meaningful, are really quite onerous. I would not be unhappy with that. It is not beyond the wit of our profession to consider these alternative methods of assessment and to make use of them, if they are considered appropriate.

Mr M. D. Thornton, F.F.A.: I think that the course in question was the Edinburgh University Diploma in Actuarial Mathematics. It covered life contingencies and compound interest, and, as part of the diploma, students sat the Faculty Part 2 examinations.

Mr A. Neill, F.F.A., F.I.A.: As one who actually has one of those diplomas, I will have a word now!

Open-book examinations are quite a good idea. On the other hand, to imply that actuaries just write reports does not seem to be entirely realistic. Actuaries also go to meetings of Boards of Directors; they go to clients to explain pension fund valuations; they have to know some detail off the top of their heads, and the job is not entirely writing reports, where I agree that you can refer to the books.

On examinations, I do not like the suggestion that there should be a choice of questions. Among other things, it makes the papers difficult to set fairly, and to ensure that people are not just missing out chunks of their reading.

On examiners, it used to be that examiners were always former tutors. This is most desirable, both for them and their own education, and to have such experience before becoming examiners. I do not think that happens nowadays, which is most unfortunate. Examiners have to be competent. I remember, on a two-paper subject, that the students were marked in the range of 20% to 80% on my paper, and on my colleague's paper it varied from 46% to 52%. The pass mark was 55%.

I commend the approach of consultation in Europe, and wider. It opened my eyes to what other people were doing when I attended the Groupe Consultatif Summer School on education held in Dublin in 1992. Education was one of the things that I, for one, was keen on when I was a founder member of the McCrossan Group, the same year.

One criticism that I have of the current arrangement is that a casual enquirer, like myself, in the profession or outside, used to be able to look up syllabuses, courses of reading, textbooks and old examination papers, perhaps to prepare themselves to speak at a meeting such as this. This just does not happen now.

It seems reprehensible that too many non-actuaries are getting to be Chief Executives and Senior Managers of life offices. I remind you of our Royal Charter, which implies that actuaries are in charge. "The actuary is to take care that the Institution under his charge is founded on a safe basis". What are the systems of education and examinations going to do to improve this position?

Ms H. M. McGill-Brown (a Faculty student)**:** I was wondering whether any consideration has been given to other methods of assessment, for example, an interview, or having to do a presentation in front of a panel?

Usually, whenever you make that comment, the initial reaction is, "Oh, you cannot do that. People would find it intimidating and difficult". However, nobody would pretend that students do not find the present examinations both intimidating and difficult.

Given the amount of interest in the skills that an actuary requires for the future, in my experience many actuaries in our company seem to spend much of their time doing presentations. This seems to be a very valuable and necessary skill. Since there are going to be a large number of discrete exams under the proposed new system, I suggest that one could be used to assess skills that were not just based on written reports.

Mr Daykin: I was very interested in the suggestion that we should have some oral presentations. A few weeks ago I was asked to examine the first generation of pensions actuaries in Russia. They had had a written examination, and we then had to perform the oral examination. We had three candidates in front of four examiners. Each student had an hour and a half in front of us. We repeated this process over the course of three days. It was pretty intensive and was quite interesting, but I do not know that we could cope with the numbers that would be involved in doing it for the Institute and the Faculty.

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Another form of alternative assessment which is being seriously considered is the case study model, particularly for the Fellowship paper. Other professional bodies, such as the Institute of Chartered Accountants in Scotland, use this method. We think that could be quite promising, with or without handing out the case study in advance. One possibility would be to issue a case study in advance of the examination, and then examine it within examination conditions.

Turning to another aspect which has been touched on, the international interface, the Groupe Consultatif started the process of looking at the syllabus for the European actuary a few years ago at the Dublin seminar. The core syllabus for the actuary of the future in Europe has now been completed, and was adopted by the Groupe Consultatif in October 1996. It has been recommended to the member associations for implementation.

There will be a seminar, in July 1997, of representatives from different countries, from universities as well as from the associations, to discuss the implementation of that core syllabus. It is not unlike what we have for the Institute and the Faculty, since we had quite a lot of influence in putting it together. There will be some impact on our syllabus, and we have tried to take on board what the Groupe Consultatif is doing as we have developed our new syllabus.

As Chairman of the IFAA, I state briefly that we have started an education process there also. It is still at a relatively early stage. It is not likely to be as comprehensive as the Groupe Consultatif in terms of establishing a detailed core syllabus right up to fully qualified level. It is more likely to concentrate, at least initially, on the earlier subjects, the basic toolkit of the actuary, in order to be able to get agreement across all the different types of association that we have within the IFAA, which include, for example, the Casualty Actuarial Society and the Japanese Pensions Actuaries, which organisations are more specialised in their nature. It is also the intention that it will be more a listing of topics than going down to very detailed syllabus objectives, as the Groupe Consultatif proposals do.

Nevertheless, we are moving towards the position where, under the IFAA, there will be agreement on the basic actuarial techniques part of the syllabus, corresponding to Subjects 1-9 in the new proposals that we now have before us. I think that it is the vision of the IFAA that that material will be sufficiently common throughout all the associations to be mutually recognisable in terms of actuaries wanting to transfer to, or to gain qualifications in, other countries, and that we may be able to go beyond that, perhaps on a bilateral basis initially, as we have already done between the Institute, the Faculty and the Australian Institute, in order to achieve mutual recognition at a higher level.

All of this points towards the need to try to push the U.K. specific material up to the top of the system, and to try to get as many as possible of the examinations based on general principles. We get feedback from those who are developing the syllabus or writing the material, that you cannot teach the principles of life insurance without having some context in which it is operating. You cannot do it in a vacuum. The idea is that as much as possible of the detail should be kept to the Fellowship, which would then be the U.K. specific part of the qualification. We will encourage other countries to use our examination system and develop their own Fellowship paper. There already has been some interest in some countries. The Irish might be the first to move to have a specific paper on pensions. The South Africans might be able to follow suit. We have a Chinese Fellowship paper in preparation. The Chinese students are sitting our examinations, as Dr Hardy observed, and we did think that it was unfair to inflict on them our current Fellowship paper. The proposal is that they should have a tailored Fellowship paper if they get to that stage.

Dr Macdonald: I pick up a point that Mr Neill made, and put in a plea for a return to textbooks, at least for parts of the syllabus. There seemed to be good reasons for deciding to replace textbooks five years ago, mainly relating to the way in which the textbooks on the later subjects were out of date, and the difficulty in keeping them up to date. That never applied, to the same extent, in the early subjects. The material tends to be rather more stable for 10 or 20 years, and then there is a sea change in views or techniques, and a new textbook comes along. There is no particular difficulty with that model.

Now we are pushing all the country-specific and detailed parts of the later subjects, so far as possible, to the Fellowship level, something which is, perhaps, also increasingly true of the

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Application Stage. When we teach overseas, one of the first questions we hear is, "Where are the British textbooks?" The internationalisation which has been brought about by the Groupe Consultatif and the IFAA means people are going to ask "Where are the textbooks?"

There will be a gap in the market. If they do not come from authors and publishers in the U.K., then they will, nevertheless, come from somewhere. This would be tremendously useful in the universities, where the current mode of providing material, even at reduced prices for university students, is not much use. We would strongly favour a return to textbooks wherever possible.

Mr J. M. Lynch (a Faculty student)**:** Many students, at the moment, are very disillusioned with the low pass rate, especially in the later examinations and in the Fellowship. I hope that the introduction of these new examinations does not lower the pass rate further.

Mr Telfer: Transitional arrangements are of particular interest to current students, especially students of the later examinations. In particular, they are probably going to influence what subjects we would like to sit over the next couple of years before the new exams come in. When will these be available?

As I understand it, the current recommended study time for investment through to pensions is around 400 hours. The paper states that a 3-hour paper, covering all of investment and pensions, implies study of 150 hours. Does this mean that the course material is going to be more than halved?

Regarding the examinations, I have discussed these with eight different students, and I have had eight different comments as to how the examinations are marked. It would be very beneficial if a statement could be given to students stating clearly how examinations are marked. Specimen solutions are no use unless we are told what the approximate pass mark was, and what the pass marks were of previous papers.

Is there any chance of getting the results more quickly, and of having our papers returned? It is no good being told four months after the event that you have failed, with a copy of the solutions and a copy of the question paper, if you cannot remember what you have written.

Dr Scott: In relation to the universities getting exemption from actuarial examinations, I have quite a lot of experience, both with the professional examinations themselves and as an external examiner and a lecturer. If people were presented with different papers, by the profession and by universities, they would have a great deal of difficulty knowing which was which, and judging which was the harder. I do not think that there is any reason to say that university exemption papers are easier. One possibility is that students find them easier to pass because they have more time to devote to studying, because they are not working at the same time.

Mr J. F. Hylands, F.F.A. (replying)**:** I will not respond to all the points that were made during the discussion, but I should like to thank you all very much for making them. The response to the consultation has been considerable. The Education and CPD Board and Councils will be pondering on the outcome of the consultation and firming up on the proposals.

As was said by Mr Dumbreck, we cannot please everyone, but we have tried to have as full a consultation process as we possibly could, to analyse the responses to the issues as carefully as we could, and, therefore, to put in place a structure that will be a sound foundation to take the profession into the next century. I cannot promise that it will be long lasting, because the pace of change is such that we are likely to have to re-visit the question in a few years' time.

There were a number of questions posed, and I start with these before touching on some of the earlier points. Specific questions: when will the transitional arrangements be announced? My hope would be that, as soon as we have firmed up on the structure of the new examinations and the syllabus, we will be able to announce how transitional arrangements will operate. We are acutely aware of the anxiety that is caused whenever there is a change to the examination syllabus. We hope to be able to frame the transitional arrangements so that it is as easy as possible for students who have started under the existing arrangements to move through into the new arrangements. Behind that answer is a degree of uncertainty as to when the new arrangements themselves will come into place. One or two speakers mentioned this. Professor Wilkie alluded to the difficulty, if not the

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impossibility, of creating appropriate material for the new Subjects 5 and 9, in particular, if we stick to the proposed timetable in the consultation document. We will need to reconsider that point.

Will the course materials be reduced in size significantly? I fervently hope so. As was said at the beginning, we believe that one of the issues with the present system is the volume of material that students have to get through. However well constructed or sensible the material might be, the workload of getting through it can, in some cases, leave little time to get to grips with the real issues that are being covered, as opposed to trying, at a superficial level, to grasp all the facts that are presented. We very much hope that the new course material will be smaller.

The points on marking schemes, pass marks, past papers and the relevance of the information that is presented have been considered many times, and will be considered again. I assure you that we and the Board of Examiners, are not being deliberately difficult in not giving, or in withholding, information. There has been a considerable move in recent years towards greater openness in terms of how the examinations and the results are presented.

I accept that we can do more to make the examiners' reports meaningful and relevant. I should very much like to do so. I should also like very much to be able to produce the results in about a quarter of the time that it currently takes. I am not making any promises, because here we face considerable difficulties.

Someone mentioned earlier that the Scottish Chartered Accountants use a case study approach to examining the later parts in their professional examinations. They also have an approach to marking their examinations which essentially involves locking the examiners in a room and not letting them out until they have finished. It has been suggested that we could profitably adopt a similar arrangement. We need to give serious consideration to something along those lines. With our present arrangements, it takes an inordinately long time to get the results back to the students. This is not because the examiners are slacking or taking things easy. The present process does not seem capable of producing the results quickly. We need to consider alternatives.

I shall now try to summarise what I think is the sense of the discussion, the sense of the consultation that we have already seen and analysed, but which you have not yet had the benefit of knowing about, and also what the current position of the Education and CPD Board is on some of these issues.

On the Foundation Stage, should we be strengthening the mathematical and statistical content, and is it right to emphasise the role of models? I think that the overwhelming view is that the answer to these questions is 'yes'. The caveat, however, is that mathematics should not be there for its own sake. We should be careful about teaching rigorous proofs where that is not necessary. We should be ensuring that, in the teaching of models, we teach their use and misuse, the conditions in which they ought to be used and the conditions in which they ought not to be used, and that we deepen the understanding. The objective is not to teach mathematics or models for their own sake, but as a means of equipping the actuary with an appropriate toolkit.

Are the proposals targeted to provide the technical skills likely to be needed by actuaries in the future? I think that the sense of the discussion is very much that they are along the right lines and moving in the right direction.

I do not think there was much said in the discussion about the issue of discouraging students with non-mathematical degree subjects from entering the profession or on the question of what is the appropriate entry requirement. On the whole, the view from previous responses is that it is necessary for students to have a minimum level of mathematics. That ought not to discourage students with a level of mathematics that might be picked up from a reasonably numerate economics degree, for example, from entering the profession. The new subjects that are proposed have mathematics which is not all that difficult. It may be unfamiliar to many of us, but, properly presented, it ought not to be off-putting to a student with a reasonable grounding in some numerate disciplines. By no means would a degree in mathematics or statistics be an essential pre-requisite to embarking on this course. There is broad support for leaving the entry requirements unchanged.

Moving on to the Application and Fellowship Stages, Professor Wilkie made a comment which I should like to pick up. He suggested that the present proposals were for four easy subjects and one difficult one. That is not the intention. There will be four subjects at the Application Stage, which

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seek to teach and examine principles and their applications. They will be different in nature from the present Subjects E-H. They will not necessarily be any easier than the present Subjects E-H. They may be just as difficult, although, one hopes, with higher pass rates. Nonetheless, they are not intended to be four easy subjects, then followed by this tremendous hurdle of the Fellowship, which would be the hard bit. The Fellowship will be different in nature from the Application parts, and it will contain the detail. There is considerable support for that from the discussion that we have had. I am encouraged that we have got that broadly correct.

The point was made that the proposed approach to specialisation is probably correct for now, but the direction for the future is probably towards greater specialisation. We accept that view as the likely outcome.

Should we move closer to the Australian approach? The matter was not discussed in much detail here. It seems to us, after the benefit of the consultation process, that the balance of advantage for the present remains in retaining the Application subjects under the four headings: investment; life assurance; general insurance; and pensions. However, we need to emphasise, throughout, the commonality of the principles, where it exists, across these four subject areas.

As work has been going ahead on preparing outline syllabuses, it is becoming clear where the common areas lie, and we are giving consideration as to how those common areas might be pulled out to the front of the relevant courses to avoid undue repetition across the four Application areas.

It may well be that we evolve, over time, towards the Australian model of having, not four separate subjects, but one subject based on the control cycle. At the same time, however, the Australian approach is by no means bedded down yet. It may be that they are saying, at the moment, that they may evolve, over time, towards the U.K. approach of having some separation.

Should further Fellowship subjects be introduced, and if so in which areas? There is a sense which supports that aim, without suggesting that we should be pushing towards it at any great speed.

Moving on to the third section, Assessment, Qualifications and CPD, there is significant support for the use of assessment methods other than closed book. It is not essential that we change our assessment methods at the same time as we introduce the new arrangements. Our preference, at present, is to allow the assessment methods to evolve over a slightly longer timeframe, particularly if, as seems very attractive, we move into the area of using case studies, seen or unseen, as the method of assessment for the Fellowship. There are resource implications in the transition from our present closed-book examinations to such an arrangement. The transition may be facilitated by using open-book exams for the Fellowship at an early stage. No decisions have been made. It is something to which we need to give serious consideration.

Other suggestions have been made here about different methods of assessment; oral examinations and presentations. We take those points on board, while recognising, as Mr Daykin pointed out, the difficulties of using such methods with the numbers and, indeed, the geographical spread of students that we have in the Institute as well as in the Faculty.

We did not discuss, in any detail, whether the Faculty and the Institute should be prepared to grant exemptions. Our present view, in the Education and CPD Board, is that we should allow exemptions from the Foundation subjects for students who have completed appropriate courses, but we should proceed with caution towards extending that further up into the Application Stage. We will be looking, in particular, at Subject 10, Investment, which seems to be a likely first area for consideration.

We had a vote on the positioning of the Communication paper. Most people went for the middle option. The basic question is whether it is appropriate to retain the examination. I did not notice many people abstaining in the vote, so I assume that that endorses the view that we should retain the examination. We will have to consider the issue of where best to place it.

In response to a particular point that was made, the passage of time between the studying of the Foundation elements and the taking of the Communication examination was not intended to cause any particular problems, because the subject matter, the technical content of the Communication examination, was intended to be at a sufficiently straightforward level. That may, however, be slightly optimistic.

We take the points about the intermediate qualifications, the desirability of ensuring that the Code

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of Conduct can be applied to anyone who is holding himself out as possessing a qualification from the actuarial profession, and the matter is being actively pursued.

I do not think that anybody tried to answer the question about how actuaries can be encouraged to enhance their skills through CPD. I suppose that 'by all means possible' is the only sensible answer, with combinations of carrots and sticks in the shape of practising certificates and the like.

We did not discuss it directly, but much of what was said was relevant to the question of encouraging individuals to move from one area of specialisation to another. If we have the Fellowship examination in one subject as the normal route to qualification, the option may be available to take the Fellowship examination in other subjects at a later stage, or to study for advanced certificates in a number of other subjects.

The final point that I should like to comment on is that raised by Mr Neill on the lack of material that he, or anyone else, can look up nowadays to define what the actuarial profession is about. That was amplified by Dr Macdonald on the subject of textbooks; where are the textbooks? The closest we have at present to a set of defining documents is probably the core reading, which expands the syllabus and defines the syllabus in terms of its breadth and depth. It is not intended to be a teaching document. It falls somewhat short of the definition of a textbook, in that it is probably rather transient. Its appearance lacks the solidity of a traditional textbook and it has been put together with a particular purpose in mind — that of augmenting the syllabus and clarifying the syllabus. There, in principle, is the foundation for something that defines what our profession is about, at least in the stage up to the Fellowship qualification.

We very much take the point about textbooks and the desirability of there being something rather more rigorous and extensive to define what we are about as a profession. There has been some discussion on this in the Education and CPD Board. We are in favour of supporting a more widespread development of textbooks, while recognising that we must not go back to the days where tuition consisted of a course of reading with cross-references to a number of textbooks. We have to make sure that we can integrate the various sources of information properly, and provide a coherent and sensible education and tuition service to our students.

I thank you for participating in the discussion. Your feedback will be looked at carefully, and will be very useful to us in taking forward the education strategy.

The President (Mr P. H. Grace, F.F.A.): I thank both members and students for their contributions. The spontaneous contributions were very much appreciated. We have had a very useful and lively discussion. This must be a unique occasion. We have had contributions at one meeting from five Past-Presidents, including a Past President of the Institute. I suspect that this is a record. An equal number of students have also contributed. I ask you to show your appreciation to Mr Dumbreck and to Mr Hylands. I should also like you to thank Dr Goodwin, the Chief Education Executive, for her input to the consultation paper.

WRITTEN CONTRIBUTION

Mr M. D. Thornton, F.F.A.: If ever a profession shot itself in the foot, we did it when we accepted the rule that the Appointed Actuary must not be the chief executive. (I was told that it does not have the force of law, but it is widely observed.) Not only does that remove the old top job of Manager and Actuary, but it is too easily read as implying that the chief executive must not be an actuary, or need not be an actuary, or is better drawn from professions more business orientated and less esoterically mathematical. It is not pure chance that more of our number than before achieve a professorial chair in a university at the same time as fewer reach a managerial chair in a life office.

That unfortunate rule came in to provide a check, or relieve the pressure, on the sole actuary in a young office. What we should have done, instead, was to follow the accountants. Just as the in-house accounting work is audited by an independent firm of accountants, so, in cases where it was required, exemption being given to old large with-profits offices, the valuation of the manager and actuary could be reported on by an independent firm of actuaries, who would certify that they had been given access to, etc., that the principles of the valuation were in accordance, etc., and that the reserves held

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were such as satisfied generally accepted standards, etc., (never that they are adequate — only God knows that!). This would have kept everything within the profession, and prevented the absurdity of someone outside our profession reviewing the adequacy of our reserves (pontificating on it, even).

Until this can be corrected, it might still be thought that our profession is the natural choice for chief executives in a life office, but as our syllabus has deepened mathematically it has narrowed business-wise. Law went many years ago, but an actuary would benefit from a nodding acquaintance with *Houseman's Law of Life Assurance.* Reversions went also, yet that was the only time that we told our students that the value of an interest in life depends on who wants to know — a buyer; a seller; the estate duty office? That was the only time that we told them that they were businessmen, and that the market was more important than the mathematics.

In staking our claim to the managerial chair, the leaflet *Actuaries make Financial Sense of the Future* is not as helpful as it should be. To say "they enable financial decisions to be made" already surrenders our claim. Our job should be to make the decisions, not to enable others to make them. We are not here to play Jeeves to someone else's Bertie Wooster. This shows the hand of the consultancy side of our profession. They are content to advise, to enable — and very well they do it. This bit must have been drafted in London, where the Institute Council has too few life office men, far too few chief executives. Mr Ferguson drew attention to this in his Presidential Address. The whole leaflet relegates us to the advisory positions.

The corrective to the lack of business orientation in the syllabus should come in CPD. This must not be more mathematics. The ancient American definition of an actuary as a Scotsman with a little mathematics and a strong sense of business is all too easily updated by outsiders to one with strong mathematics and little sense of business. The subjects for CPD should be those that make up the degree of Master of Business Administration. Introductions to law and accountancy would not come amiss. (We had them both in our syllabus and dropped them.) Any foundation document should emphasise, not just our ability to advise, but also our ability to decide, to control, to be in charge.

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