la forme de nouvelles éditions, certaines "entièrement refondues"; cela a été le cas de la plupart des dix chapitres présentés ici, qui sont dans l'ordre:

Part 1. - Topological Structures. Uniform Structures. Topological Groups. Real Numbers.

Part 2. - One-parameter groups. Real number spaces and projective spaces. The additive groups R^n. Complex numbers. Use of real numbers in general topology. Function spaces.

Le tout est en deux beaux volumes compacts et plaisants. Aucune faute d'impression n'a pu être relevée, si ce n'est un emploi fantaisiste de majuscules, comme il apparaît dans les titres: Real Numbers (dans le premier volume), et Complex Numbers (dans le second volume). Une telle inconsistence n'est certainement pas à attribuer à l'imprimeur. Celui-ci a reproduit religieusement les signes typographiques caractéristiques des éditions françaises (virage dangereux, problème difficile, ...).

La possibilité d'accéder à Bourbaki en anglais sera particulièrement appréciée par les étudiants de langue anglaise des Universités de ce continent, qui n'auront plus ainsi qu'une barrière à franchir. Sans doute, il existe d'excellents traités de Topologie Générale en anglais (beaucoup plus qu'en français!). Mais le caractère encyclopédique de Bourbaki lui confère une place a part, évidemment d'abord sur les rayons de toutes les bibliothèques mathématiques. Jusqu'ici Bourbaki se présentait en fascicules la plupart du temps un peu malmenés et correspondant à des éditions différentes; cela necessitait des tableaux de concordance entre les différentes éditions pour les références, rendues ainsi tres pénibles. Il est à prévoir que cette édition anglaise éliminera peu à peu ces fascicules séparés et dépareillés, et cela peut-être même dans les bibliothèques françaises. N'offre-t-elle pas la possibilite d'avoir sous un faible volume et à un prix compétitif tous les chapitres de Topologie Générale "du même âge", et les références correspondantes, miracle réalisé jusqu'ici pratiquement dans aucune bibliothèque, publique ou privée.

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<u>The four-color problem</u>, by Oystein Ore. Academic Press, New York, 1967. xv + 259 pages. $12.00.

The four-colour problem is unsolved, but many interesting things are known about it. It is the central problem of the theory of planar maps. How much of that theory is the by-product of attempts to solve the problem! And who works on the theory of planar maps without keeping at least one eye upon it?

This is an excellent book on the Four Colour Problem, and it is therefore an excellent text-book on planar graphs. The first few chapters, on general theory, deal with such matters as bridges, straight-line representation and the Euler polyhedron formula. The fifth chapter presents a proof of the theorem that a planar graph which is not separated by three or fewer vertices has a Hamiltonian circuit.

The next four chapters give the basic theory of map-colourings. In the literature this is usually presented for cubic maps, or their dual triangulations, only. It deals for example with Tait cycles and Heawood congruences. Professor Ore generalizes it to all planar maps and specializes to cubic maps only in Chapter 9.

The four colour problem has analogues in the theory of graphs that are not necessarily planar. Thus Hadwiger has conjectured that if a graph without loops is not n-colourable on its vertices then it can be contracted to a complete (N + 1)-graph by a sequence of operations each of which either deletes an edge or contracts an edge to a single point. Wagner has shown that the Hadwiger conjecture for n = 5 not only implies the four colour conjecture but is equivalent to it. Such matters are discussed in Chapter 10.

Chapter 11 is largely concerned with edge-critical k-chromatic graphs. A "k-chromatic" graph is one that can be vertex-coloured in k but not fewer colours. Such a graph is "edge-critical" if all graphs formed from it by deleting edges require fewer than k colours. The author proves, and generalizes somewhat, a theorem of Hajós to the effect that each edge-critical k-chromatic graph can be obtained from a set of k-simplexes by a sequence of specified simple constructions. One feels that this theorem ought to lead to an inductive proof of the Hadwiger conjecture, but mysteriously it has not.

The author returns to the plane in Chapter 12 to present the classical theory of reductions, in terms of vertex-colourings. The chapter culminates in a proof of Winn's theorem that every planar map with fewer than 36 faces can be face-coloured in four colours.

Chapter 13 deals with 3-colour problems and includes a proof of Grötzsch's Theorem that every planar graph with no triangle (or loop) can be 3-coloured on its vertices. The last chapter deals with the theorems of Shannon and Vizing on edge-colourings.

It is to be expected that a number of errors will creep into a pioneering work of this kind. Several have been pointed out to me. For example the trouble with the graph of Figure 9.4.2 arises not at the double join as stated but at the cut-vertex. This represents an isthmus in the associated cubic graph. But these errors should not cause much difficulty to the wary reader.

It is possible of course to think of omissions, for example the theory of Hamiltonian circuits in cubic graphs. Nevertheless most of the important theorems connected with the four colour problem are here, for the first time, collected in one book.

W.T. Tutte

<u>De proportionibus proportionum and Ad pauca respicientes</u>, by Nicole Oresme. Edited with introductions, English translations, and critical notes by Edward Grant. The University of Wisconsin Press: Madison, Milwaukee, and London, 1966. xxii + 466 pages, 11 plates. $10.75.

"No scientific figure in the Middle Ages combines in his works such originality with the more traditional views of natural philosophy as does Oresme" - this is the judgement of Prof. Marshall Clagett, editor of the well known series in which this edition of two of Oresme's treatises is published. Perhaps best known to mathematicians for his theory of the 'latitudines formarum', a kind of graphical representation of variable quantities, Oresme (1323?-1382) also brought to higher perfection the theory of proportions which was first developed by Thomas Bradwardine (1290?-1349). This Oxford mathematician had replaced the customary form $V \propto \Gamma/R$ of Aristotle's law of motion (V = velocity, F = motive power, R = resistance) by the more sophisticated relation $F_2/R_2 = (F_1/R_1)^{V_2/V_1}$; the expression on the right hand side of the last equation was called a 'ratio of ratios'. "De proportionibus proportionum" is a treatise about the handling of such 'ratio of ratios'. It is more advanced than the better known "Algorismus proportionum" of the same author. Of particular interest is the consideration of irrational 'ratios of ratios' and the conclusion that the heavenly motions (which are considered in greater detail in the second treatise of this edition) are most probably incommensurable to one another. This gives Oresme a weapon with which to fight against astrological prediction.

The present edition of the Latin texts is based on several manuscripts and equipped with an English translation, a lengthy introduction, variant readings, critical notes, bibliography and index. Other works by Oresme are being prepared for edition in the same series. They will help to prove - if a proof is still needed - that the so-called "dark" Middle Ages were not so dark, after all, as previous generations were used to believe.

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<u>Lecons sur les fonctions calculables</u>, par V.A. Ouspenski, Traduit du russe par André Chauvin. Hermann, Paris, 1966. 412 pages. 48F.