Geological Processes on Continental Margins: Sedimentation, Mass-Wasting and Stability, Stoker M.S., Evans D. and Cramp A. (eds.). Geological Society (London) Special Publication No. 129, 1998. 355 pp, £72, ISBN 1-897799-97-7.

Continental margins form the boundary between shallow shelf seas and the deep ocean basins encompassing the shelf edge, upper slope and lower slope. The shelf edge and upper slope regime is characterized by high sediment fluxes and mass failures leading to abundant down-slope resedimentation. In contrast the lower slope is influenced by ocean boundary currents which act to redistribute the fine-grained hemipelagic and downslope sediment component into laterally extensive drift deposits. Recent interest in the geology of continental margins follows two principal research paths with widely different objectives: (1) the need to obtain palaeoceanographic records of high temporal resolution in order to decipher the past history of oceanic climate and circulation; (2) the need to understand seafloor instability and mass transport processes as risk factors in connection with hydrocarbon exploration in deep waters, off the shelf margin. The purpose of this Geological Society Special Publication is to provide examples of current and recent work on geological processes on continental margins. Hence, it should attract a wide audience of academics and professionals working within the field of marine geoscience. The volume consists of 19 papers which focus on (1) downslope, (2) alongslope and (3) hemipelagic processes. Downslope processes are covered by ten papers whereas hemipelagic processes are represented by only two papers. The geographical coverage of the volume is world-wide but the focus is on the NE Atlantic margin off the British Isles (11 studies). Other regions covered are the Mediterranean Sea, the Gulf of Alaska, the Brazilian continental margin, the Western Antarctic Peninsula and the SE Greenland margin.

The majority of studies are located on continental margins from mid to high latitudes where present shelf slope morphology and architecture were determined by repeated growth and decay of Pleistocene ice sheets. For this reason sedimentary processes related to glacial dynamics is a common theme throughout the volume. Depositional processes on the Barra and Sula Sgeir Fan inferred from acoustic imaging and seismic stratigraphy form the main subject of three papers by Holmes et al., Armishaw et al. and Baltzer et al. Since the mid-Miocene these slope apron fan systems have evolved as the main depocentres on the British Atlantic margin. Their present day fan morphology is largely the result of glacigenic debris-flows fed by ice streams during periods of maximum glacial expansion and low sea level stands. However, mass flow deposits representing events of presumed non-glacial origin are also present on these fan systems. These events were possibly triggered by seismic activity and over-pressure in the sediment pile caused by methane gas escape. Two papers by Clausen and Ercilla et al. describe the acoustic characters of shelf-basin transects on high-latitude polar margins, South East Greenland and the Western Antarctic Peninsula respectively. At both sites shelf progradation was promoted by mass flow events during periods of ice sheet expansion, while migrating bed-forms and erosional features along the lower slope provide evidence of present strong bottom current activity. In contrast to the commonly depicted passive margin setting Dobson et al. provide an interesting account of a glaciated transform margin in the Gulf of Alaska. They show how fan depositional cycles relate to expansion of tidewater glaciers across the shelf and tectonic translation along the Queen Charlotte fault zone causing a northward movement of the fan depocenters. An example of modern downslope processes on a non-glaciated margin is provided by Mulder et al. They demonstrate how modern catastrophic fluvial discharges from the Var River, off Nice, can lead to cascading sediment plumes (or hyperpycnal plumes) which are then considered as a mechanism for inversely graded turbidite deposits on the Var deep sea fan.

A comprehensive overview of Palaeocene to Neogene sediment drift development in the Rockall basins is provided by Stoker. Sedimentation related to bottom current activity was initiated during mid-late Eocene following early Paleogene subsidence of the Rockall Trough and Hatton–Rockall Basin. The current regime of late Eocene to mid Miocene was vigorous and led to upslope accretion of migrating sediment bodies onto the flanks of the Rockall Trough. From the mid-Miocene a new circulation regime emerged following the submergence of the Scotland–Greenland ridge with accumulation persisting in the eastern parts of the Rockall Trough whereas sea bed erosion prevailed along its western margin.

A high-resolution Late Quaternary record of current controlled sedimentation on the north Faeroese margin is presented by Rasmussen et al. Fifteen sediment cycles comprising alternating layers of dark silty, basaltic sediments and lighter, clayey sediments enriched in ice rafted sand are correlated with millennial scale climate oscillations (Dansgaard–Oeschger events) recorded in the Greenland ice cores. The darker layers were deposited during warm interstadials when circulation in the Norwegian Sea resembled the modern anti-estuarine pattern, with a strong eastward sediment flux along the slope of the northern Faeroe–Iceland margin. During cold stadials the centre of thermohaline convection shifted from the Norwegian sea to south of the Scotland–Greenland ridge, bottom circulation weakened and sediment was mainly derived through glacimarine input from the eastern...
Atlantic margin. Interestingly, bulk accumulation rates were significantly higher during interstadials than during stadials including Heinrich events 1, 2 and 4.

A paper by Stow and Tabrez presenting facies models of hemipelagic deposits is particularly noteworthy as this topic rarely appears in the literature. After an introduction to hemipelagic facies on the Makran and Oman margin, north-western Indian Ocean, they discuss the characteristics of modern and ancient hemipelagites. The diagnostic criteria for recognition of fine-grained turbidites, muddy contourites, hemipelagites and pelagites is summarized in a useful table. From their discussion it is clear that hemipelagites can be difficult to distinguish from hemiturbidites and muddy contourites and that transitional grading between these facies is common.

Glacial to recent depositional fluxes on the continental slope SW of Ireland is the theme of a paper by Hall and McCave, who use magnetic susceptibility, tephra abundance, grain size parameters, inorganic carbon content and $^{14}$C dating to derive a chronological framework and mass accumulation rates for six cores. An interesting aspect of this study is the use of sortable silt mean size (10-63 µm) as an indicator of palaeocurrent strength.

In summary, the volume presents a broad selection of current geological and sedimentological research on continental margins with emphasis on processes of downslope and alongslope sediment transfer. It contains numerous diagrams, maps and seismic profiles of high quality. The content of this book is perhaps of more interest to the geophysically oriented marine geologist than to the palaeoceanographer for whom high temporal resolution is important. One or two examples of quantitative modelling within a framework of sequence stratigraphy and sea level changes would have benefited the broad scope of this volume. I would, however, recommend it to all marine geoscientists because of its content of high-quality papers and its aim of stimulating an integrated and process-oriented approach to continental margins.

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Geology of the Invermoriston district. F. May and A. J. Highton. Memoir of the British Geological Survey for 1:50 000 Geological Sheet 73W (Scotland), HMSO London. 1997, X + 77 pp, 37 figs., 4 plates, 13 tables, £30, ISBN 0-11-884532-2.

I have long been a fan of the old-style 'Sheet Memoirs' of the Geological Survey, particularly those that describe classic areas of the Highlands. Their authors, who had mapped the ground from scratch during the primary survey, were allowed the time and space to describe field relationships in a detail that is impossible today, and they restricted interpretation to direct inferences, with just the occasional reference to contemporary controversies. The result was a timeless repository of primary data, independent of the changing fashions of geological thought.

Rising production costs brought an end to such indulgence. BGS proposed to abandon the sheet memoir series on more than one occasion, but they survive because there is a perceived need to bring together, and make available, detailed information that cannot be presented on the map. Today, particularly in 'hard rock' areas, memoirs thus tend to be dominated by geochemical data, generated routinely by rapid analytical methods, and requiring interpretation. The presentational style of the 1:50 000 series has also changed, and much additional information is included in the marginalia in the form of synoptic maps. Some of these, for example potential field geophysical data, can only be interpreted within the regional context, and the memoir is the place to do this.

Then there are petrographic and structural data, stratigraphical details and, of course, the all-important field relationships. Because much of this information will already have been recorded in technical reports and perhaps other publications, it seems to me that an important function of the sheet memoir must also be to make a first order interpretation of each dataset – and then present a brief synthesis of the geological history of the area.

The Invermoriston district lies in the middle of the Highlands, straddling the Great Glen, and contains some of the most difficult and indeed controversial rocks in the Caledonian orogen. How well does the memoir cope with this challenge, in the context of its twin functions, the recording of data and its interpretation?

Before discussing this, let me say that the quality of presentation is excellent, with purpose illustrations and clearly written text. Diagrams are in the current BGS format of black and white with one superimposed colour, an attractive orange-brown, and they are so much easier to read than many of the computer-generated illustrations popular today, which often have inappropriate ornament or a confusion of colours. Addition of an extra colour does require careful proof reading, and I was amused to see a triangular diagram in fig. 25 apparently under attack by a swarm of insects. These turn out to be ASMOFs from the next figure – whatever ASMOFs are; some sort of movement path. If I have a criticism of the text, it is the tendency to use unexplained jargon. But there are very few solecisms; one that grated was 'the Ordovician—Lower Devonian event of the Caledonian Orogeny' on p. 35: the Ordovician—Devonian deformation of the Highlands is the Caledonian Orogeny, by definition.

So what of the content? I found the memoir strong on data presentation, but weak on interpretation. It gives the impression that rocks are simply objects that it is sufficient to describe and analyse, not the products of geodynamic processes that operated in the distant past and can be deduced from those measurements and analyses. Let me take a few examples.

Moine and Grampian metasedimentary rocks occupy much of the map area and are covered in Chapters 3, 4 and 5. Their local stratigraphy is described without showing how it relates to the regional development of these great Proterozoic clastic sequences, and with little interpretation; for example does the jagged boundary between the Loch Eil and Glenfinnan groups on the cross-section
(fig. 3) represent a facies change as thinning of the Loch Eil Group suggests, or isoclinal folding as the diagram seems to indicate? There are good accounts of lithofacies and composition, and evidence presented of shallow-water sedimentation and provenance from uplifted basement, but no inferences are made about the depositional setting of these important rocks. This is disappointing because substantial advances have been made in recent years in understanding the tectonic controls on Proterozoic sedimentation in the Highlands, not least by BGS personnel working on the Grampian Group.

Arguably, the pre-Caledonian igneous rocks of the Highlands are even more important than the metasedimentary sequences in the evidence they provide for the tectonic evolution of the area during the Neoproterozoic. In the Invermoriston area they comprise a suite of tholeiitic amphibolites and part of the Fort Augustus body of the West Highland Granite Gneiss, described in Chapter 5. The composition and field relationships of the metabasite sheets are well presented, but again without making the obvious inferences. They are described as a sill complex, but their present orientation is due to recumbent D1–D2 folding and they surely represent a dyke swarm, which is almost of a sheeted nature in the beautiful exposures in the River Doe, unfortunately just outside the map area.

The authors follow the traditional interpretation of the granite gneiss: it represents a series of anatectic granite sheets that were generated, emplaced in the Moine rocks, and deformed into foliated gneiss during the D1 regional tectonometamorphism. Thus, a Proterozoic age for the granite gneiss has been taken to date Proterozoic orogeny in the Moine. Evidence presented in the memoir in fact shows that this cannot be so. On p. 23 appears a statement of great significance for Highland geology: 'Both the gneissose granite and metabasic rocks record all the tectonic events recognised in their metasedimentary hosts'. Since the metabasite sheets intrude the gneiss, it follows that the sequence of events was firstly, the granite protolith was generated and emplaced in the Moine rocks, then there was a period of extension-related basic magmatism, and then all three rock groups were deformed by D1–D2. Dating the granite thus does not date D1, it provides a maximum age: a re-run of the Ben Vuirich saga. I refer the interested reader to a recent report, in this journal, of Highland Field Workshops where these relationships are described and some radical inferences drawn. The importance of the statement quoted above is that it is not based on the examination of a few roadside and river sections, clear though they are, but from mapping the whole area. It emphasises the role of the sheet memoir in providing authoritative statements about key field relationships, even if, as in this instance, the obvious inferences are not drawn from them.

Another missed opportunity in my view is represented by Chapter 7 on the Old Red Sandstone rocks of the highly faulted Mealfuarvonie inlier. The text concentrates on lithofacies descriptions, but the two accompanying illustrations, figures 31 and 32, depict the structure, without comment. The cross sections show the enigmatic base of the ORS as a ‘thrust’ in places, though with highly discordant younger rocks in the hanging wall. The sections are not readily restorable, unsurprisingly in a major strike-slip zone, but seem to indicate substantial growth faulting. Some attempt could have been made to explore the interplay of deformation and fluvial sedimentation during Early Devonian movements on the Great Glen fault zone.

Thus, many of the chapters end just as they are getting interesting. The authors are experienced and perceptive Highland geologists and I cannot believe that this lack of basic interpretation was entirely their choice. Nor can it be a uniform policy, because other recent memoirs, including some reviewed in this journal, do provide scientific insights. One problem is the ten year gap between finishing the fieldwork and publication of the memoir. Perhaps their production is seen as a time-consuming chore, with no clear target audience, reflected in short print runs and corresponding high price. They must indeed be expensive of staff time. Some rethinking of their purpose seems to be needed.

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Geology of the Glasgow District, I. H. S. Hall, M. A. E. Browne, I. H. Forsyth. Memoir of the British Geological Survey, 1:50 000 Geological Sheet 30E (Scotland). The Stationery Office, London. 1998, 117 pp, £45.00, ISBN 0-11-884534-9.

For the wide geological audience, professional and amateur, in the west of Scotland and elsewhere, this memoir dealing with the Glasgow District is a welcome sight, coming as it does after a long publication drought. The history of the survey of the Glasgow sheet is long, convoluted and somewhat patchy so this, the first comprehensive description of the entire sheet, is both timely and an important addition to the literature on the area.

Carboniferous and Quaternary successions occupy much of the outcrop within the district and, together with the Devonian rocks, have been the subject of a protracted investigation by Geological Survey staff. Resurvey work commenced in 1953 and resulted in separate Solid and Drift editions of the 1:50 000 sheet published in 1993. The new Memoir draws on a rich tradition of professional and amateur geological investigation in the area, dating back over a century and a half, and represents the distillation of a huge amount of information.

Following a brief introduction, the Devonian rocks, cropping out on the north-western rim of the district, are placed within the wider regional context. Details on the alluvial fan and fluvially dispersed deposits of the Lower Devonian Teith Formation of the Strathmore Group, lead on to a description of the predominantly aeolian sediments of the Upper Devonian Stratheden Group, the latter being shown to have been deposited within a major ENE-trending basin.

Chapters three to seven form an outstanding account of the Carboniferous sediments of the district and of their
associated extrusive igneous rocks. The establishment of a formal and detailed stratigraphical nomenclature forms the spine of the description, incorporating as it does the wise decision to modify as little as possible existing and longstanding names. This policy provides an essential continuity often lacking in less thoughtful revisions.

The account begins with the environmental transition, within the Inverclyde Group, from semi-arid to fluvialite conditions, moving on to the Strathclyde Group and the lavas of the Clyde Plateau Volcanic Formation. It clarifies the history and relationships of the somewhat dissected volcanic sequence to produce a highly accessible and understandable story. However, given a personal western Midland Valley bias, why must the Survey cling to MacGregor's (1928) classification of the lavas? The names Markle, Craiglockhart, etc. based on localities in eastern Scotland convey no meaning, and are superfluous when universal and objective names are available. The Kirkwood Formation, lying in part unconformably upon the lavas, is shown to be composed of detritus weathered from an upstanding lava terrain, and is overlain by a variety of fluvial sands and gravels. The Lawmuir Formation, partly interbedded with and overlaying the Kirkwood Formation, initially contains Highland-derived quartz rich sediments from outside the lava outcrop, but later shows evidence of subsidence and the hesitant presence of the sea. The Strathclyde Group is followed by the Clackmannan Group which straddles the Dinantian–Namurian boundary leaving the Lower Limestone Group, perhaps a little awkwardly, in the Lower Carboniferous and the rest of the Group in the Upper Carboniferous. The Lower Limestone Group succession is shown to reflect the fill of a local slowly subsiding sediment-poor basin, penned in to the east by a large delta, with marine incursions providing regular limestone-dominated intervals. This regularity which, on the ground appears as cyclical sequences, is only hinted at in the text.

The Upper Carboniferous is treated in exemplary detail, with the difficulties in correlation, that bedevil all who work in the area, emerging from the copious vertical sections with which the text is illustrated.

The chapter on Carboniferous palaeontology, while quite rightly drawing attention to stratigraphically crucial faunas, does not do full justice to the richness of the fossil record within the district. A reader unfamiliar with the palaeontology of the area would gain the impression of rather run-of-the-mill faunas, instead of the hugely diverse record which is the actuality.

Short chapters on intrusive rocks and on structures lead to one of the major preoccupations of the memoir – the Quaternary succession. Well over a century's worth of mapping contract with the University of Durham which ensured that the project was carried along by Henry Emelius, the unchallenged expert on these islands. Although the last 90 years have seen a great deal of progress in interpreting the layering and related structures which occur in intrusions like the Rum Central Complex, if anything the number of new problems has more than kept pace with the acceptable solutions. The memoir is still strongly based on field observations but also includes summaries of modern geophysical and geochemical data. It is up-to-the-minute (I counted 329 references, from MacCulloch, 1819, up to 1996) and very well illustrated, with 65 figures, mostly beautifully produced coloured detailed maps, sections and stratigraphic logs, and 29 plates, again mostly coloured, showing field relationships, plus a few photomicrographs. A small criticism of the otherwise
excellent production is that some of the field photographs have a rather washed-out look. This applies to the cover photograph, which does not do justice to the colouring of Hallival or to the dramatic topographic expression of the igneous layering. A pity, because only a distant overall view of the layering is provided in the text (Plate 6), and it seems to me that an opportunity to give full impact to what must be the most internationally celebrated feature of Rum has been missed.

There is much more to the Small Isles (Rum, Eigg, Muck, Canna, Sanday, and the islets of Humla and Oigh-sgeir) than the Palaeocene Rum Central complex, and a Table inside the front cover reminds us that the exposed rocks also include Archaean (Lewisian) gneisses, Proterozoic (Torridonian) sandstones, a variety of Mesozoic sediments, Palaeocene–Eocene igneous rocks including lavas, and Quaternary deposits. Although the greater part of the Memoir was written by Henry Emelius, contributions on stratigraphy, sedimentology and palaeontology were made by J. D. Hudson, P. G. Nicolson, R. J. Steel and J. D. Peacock. Material on geophysics was provided by M. H. P. Bott, on oxygen isotopes by R. S. Harmon, R. C. Greenwood and A. J. Boyce, and on economic geology by the late M. J. Gallagher.

After a brief overview chapter, most of the geology is treated historically, starting with the oldest. As it happens, all the Lewisian rocks (which Harker thought were intermingled Tertiary acid and basic magmas) are on Rum, the majority within the Main Ring Fault, evidence of uplift on this key structure. All the main outcrops are described in considerable detail. The intense thermal alteration of the gneisses still means that they cannot be correlated with the mainland sub-divisions of the Lewisian. Chapter 3 covers the Torridon Group, which also crops out only on Rum, with several photographs and very detailed stratigraphic logs. There are no maps in this chapter and I would have liked one summarizing the distribution of the different Torridonian Formations, their relationship to the Ring Fault, and the places where the Torridonian–Lewisian unconformity can be seen or inferred. Although various sub-divisions of the Torridonian appear on detailed maps in other chapters, there is no cross-referencing, a missed opportunity. In contrast, Chapter 4 begins with a map showing the small outcrops of Mesozoic rocks on Muck, Eigg and Rum, and provides several detailed coloured maps of crucial localities, together with logs showing correlations within and between islands and descriptions of the fossil assemblages. I am no stratigrapher, but it seems to me that the treatment is thorough and full of interest for the visitor and for the reader requiring information on the offshore sediments onto which these small outcrops provide a window.

Chapters 5 to 9, 80 pp., are predominantly on igneous matters, although Palaeogene sediments are treated in Chapter 8. Field relationships dominate, but are interspersed with petrographic and geochemical data, including normative plots, mineral composition diagrams, rare-earth spidergrams, and data on radiogenic and stable isotopes. To my mind the balance between out-of-doors and lab-work is exactly right, and the references are all there for those who need more detail on the latter. Events are not treated strictly chronologically, because, for good reasons, minor intrusions are grouped in Chapter 6 and lavas in 8. A brief introduction to Chapter 5 gives a broad history of events: activity began with the Eigg Lava Formation at 63 Ma and ended with the Sgurr of Eigg pitchzone at 52 Ma. The climax was the emplacement, over about 1 Ma, of the Rum Central Complex at 58 Ma. The predominantly acid Early magmatism of the Rum Central Complex is then described in detail. The rhyodacite magmas found expression as rocks in a great variety of ways: ash-flows with fiamme, tuffisites, porphyritic rhyodacites, breccias, granophyres and microgranites, all interwoven and providing a fascinating picture of the internal evolution of an acid volcano. Minor Intrusions of a variety of ages and locations in the Small Isles are then treated, because their most significant development is on Rum in the period between the acid magmatism and the final uprise of the Central Complex. They are a riot of ultrabasic (peridotite) to acid plugs, dykes, sills and inclined sheets.

Chapter 7 brings us to the internationally celebrated layered rocks of the Rum Central Complex. Emelius tidies-up nomenclature: the rocks constitute a 'Layered Suite', divided into the 'Central', 'Eastern' and 'Western' layered intrusions, subdivided where appropriate into 'Members' and 'Units', the best-known of the latter being the 16 units of the Eastern Layered Series. The names of the rocks are rationalized too, in line with Le Maitre (1989). The evocative 'allivalite' becomes the stodgier and longer 'bytownite-troctolite' and 'harrsite' goes (it is a texture found in a variety of rocks) but can be used adjectivally – 'harristic' – for crescumulates. This very clearly written chapter is a wonderful read; one reason is that the author has avoided the miasma of acronyms which make so much recent petrological writing such a trial. It brings home brilliantly the exceptional range of igneous phenomena, explained and unexplained, that can be seen on Rum, and introduces, in just the right amount of detail, the waxing and waning of ideas on how the various features formed. Crystal settling remains the favoured mechanism for development of the small-scale layering within the major units, and slumping of the resulting crystal mush is still the best explanation of many of the most photographed structures. Emelius summarizes the views of a vast number of workers, giving their separate opinions where differences exist, as for example over the question of the load-structure or replacement origin of some of the complex interfingering at layer interfaces. There is a section on petrography, with several photomicrographs of layered suite rocks, and chemical and isotopic data, including several pages on oxygen isotopes, which are rather variable ($\delta^{18}O -6.1$ to $+10.7\%$) and unhelpful as far as the important problems of Rum are concerned.

Chapter 8 takes us island-hopping, looking at the extrusive products (and the interbedded sediments) that are the surface expression of magma-chamber complexity and wall-rock interaction. There are detailed maps, cross sections, stratigraphic logs and analytical data. The chemical range of the lavas is large, from 44 to 60 wt.% silica, and includes both nepheline- and quartz-normative types.
Chapter 9 is a short (5 pp.) summary of ideas on magma genesis and tectonic setting. The Rum volcano seems to have developed where a long-lived N–S fracture, perhaps controlling the Long Loch fault which affected the active magma chamber itself, crosses a basement ridge between the Sea of the Hebrides and Eigg basins. High-temperature, picritic liquids were parental to many of the olivine-rich rock types, but basaltic liquids were also available throughout the development of the complex. Malcolm Brown's (1956) hypothesis of periodic replenishments for the units of the Eastern Layered Intrusion is still favoured, and Emeleus summarizes briefly but clearly the still controversial views on which parts of the layered series represent replenishments and which are in situ derivatives. Recent work has led to the suggestion that the Layered Suite was fed through a system of conduits along the line of the Long Loch Fault, and it is possible that it is mushroom-shaped rather than cylindrical.

Chapter 10 covers structure, with a useful map of the main structural features of Rum, and a table summarizing the structural events, in particular the uplift–subsidence–uplift history of the Main Ring Fault which is now thought to have entirely preceded emplacement of the Layered Suite. Structural maps of the other Small Isles are also provided. Chapter 11 gives geophysical and geochronological data. There is a gravity map and two sections showing interpretations of the 70 mGal positive anomaly over Rum which badly fit an inverted flower-pot body of peridotite or a larger composite peridotite–gabbro body equally well, and a magnetic anomaly map. Palaeomagnetic and age determinations are given diagrammatically and tabulated. The most reliable and interesting are given in a footnote: $^{40}\text{Ar}/^{39}\text{Ar}$ ages on sanidines from tuffs on Muck date the start of igneous activity in the Small Isles at 62.8 and 62.4 (±0.6) Ma. Pleistocene and Recent geology are treated in detail in Chapter 12 and there are drift maps of Rum and of northern Eigg. Finally, in 13, economic geology is described. Chromite is widespread in the Layered Suite, and, tantalizingly, in the lowest exposed part of the Eastern Layered Intrusion concentrations of gold and PGE have been found. In view of Rum's status as a National Nature Reserve, the marine heavy mineral concentrations off Harris and Dibidil may be of more practical interest. There are 7 appendices, giving detailed stratigraphic successions of Mesozoic sediments, 106 chemical analyses mainly of Tertiary igneous rocks but also of Lewisian gneisses, an unnecessary table of $\delta^{18}$O measurements which merely repeats Figure 37, and a note on Geological Survey photographs. There is a very thorough 8 pp. index.

This Memoir is a worthy successor to Harker. Everyone with an interest in igneous petrology, whether based in Britain or not, should buy a copy, even at the steep price of £35. Best of all they should visit Rum, with a copy to hand, and simply enjoy this marvellous place with Henry Emeleus's masterpiece to guide them.

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