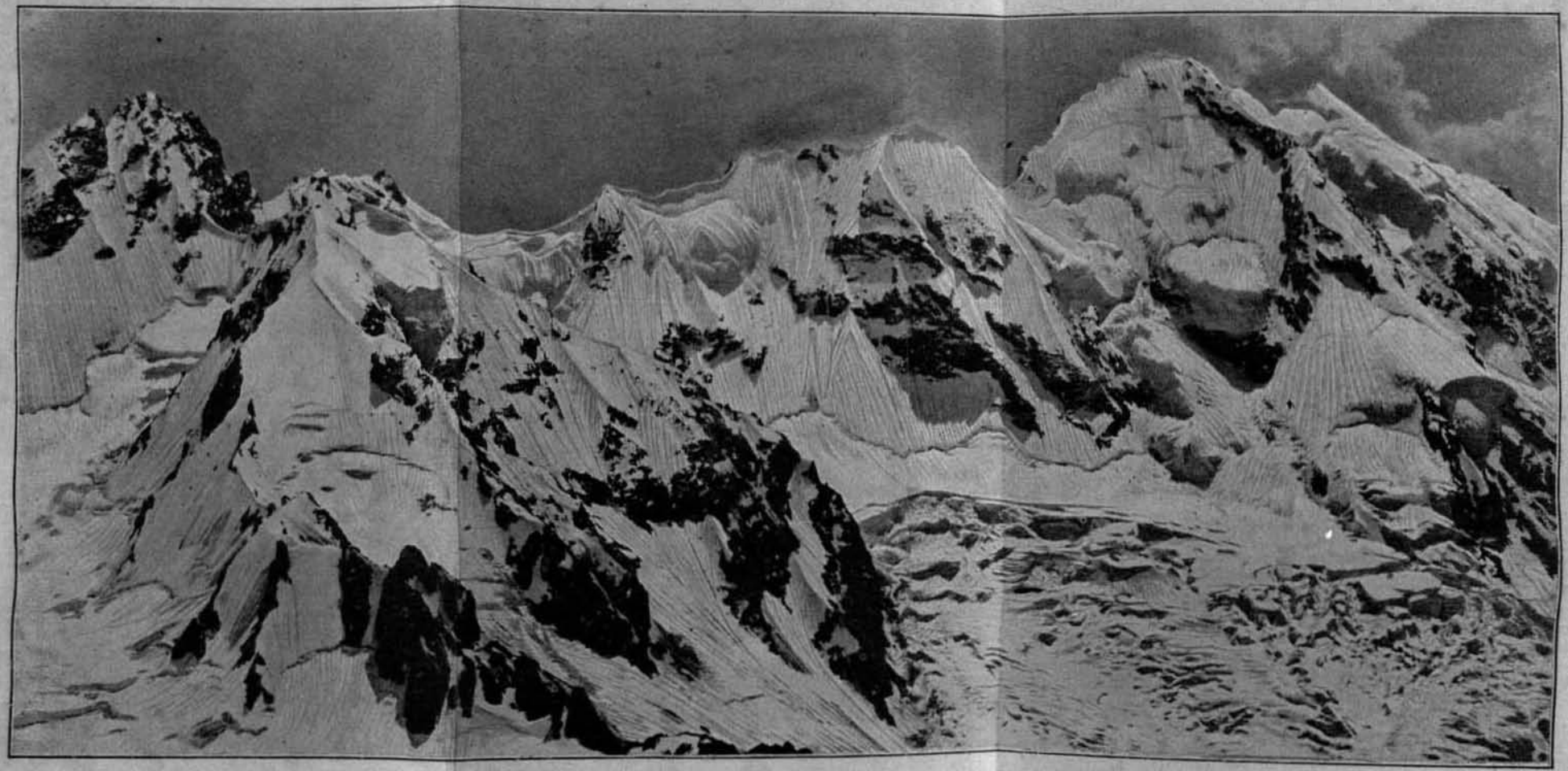
THE EXPLORATION OF
THE CAUCASUS
VOLUME I



A SPUR OF THE CAUCASUS FROM THE MESTIA PASS

THE EXPLORATION

OF

THE CAUCASUS

BY

DOUGLAS W. FRESHFIELD

LATELY PRESIDENT OF THE ALPINE CLUB

FORMERLY HONORARY SECRETARY OF THE

ROYAL GEOGRAPHICAL SOCIETY

VOLUME I

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In Memoriam

W. F. D.

1888

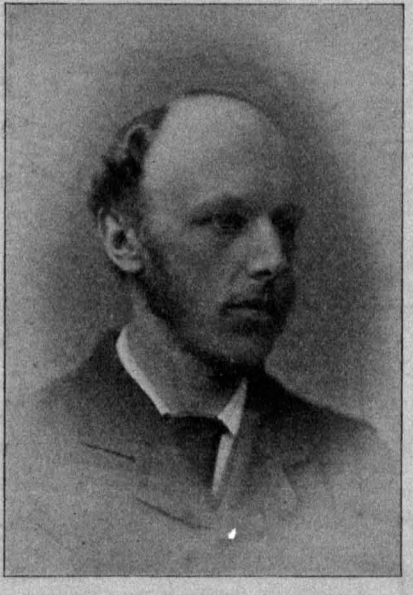
Mens nive candidior, nivium depingere sollers
Effigies vivas, sole juvante, manus:
Rupibus aeriis ingens ubi Caucasus horret,
Quam procul, heu! patriâ, dulcis amice, jaces.
Nulla suburbano posuit te pompa sepulcro,
Nec tibi supremum vox pia dixit Ave.
Discretos cineres cingunt candentia mundi
Mœnia; custodes sidera sola loci:
Corripuit gremio dignum Natura ministrum;
Pro tumulo pictæ stant monimenta nives.

White soul, in lands of purer light
Who caught the secrets of the snow,
For you no priest performed the rite,
No hireling led the funeral show;—
Lost on the far Caucasian height,
We know not how; we only know
The guardian stars their vigils keep,
The mountain walls their ward extend,
Where Nature holds in quiet sleep
Her own interpreter and friend.

D. W. F.

TO THE MEMORY OF

WILLIAM FREDERICK DONKIN



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PREFACE TO SECOND EDITION

In these volumes I have endeavoured to bring together much material previously scattered and difficult of access to the public. It has been my object to make my chapters such a series of sketches of the Central Caucasus, its scenery and its people, as may stir pleasurable memories, or anticipations among travellers, and also interest that great body of readers who love mountains and like to hear about their exploration. The arrangement of the book is in the main topographical: that is to say, I have abandoned chronological order and continuity in the narrative of particular journeys in order to bring together the facts concerning each district, or portion of the chain, into single, or consecutive, chapters. The method has its drawbacks; but on the whole these have seemed to me in the present instance to be more than counterbalanced by its advantages. The record of adventure may be less vivid, but the pictures of the country and its people should gain in definiteness, and it ought to be easier to select characteristic facts from among trivial details.

The Appendix records every New Expedition which had come to my knowledge at the date of its compilation. In the body of the work I seem to myself to have given too much space to my own doings. If I have erred in this direction, it has been partly in order to preserve some literary unity, partly because I have travelled in the country more widely and at longer intervals of time than most of my countrymen. In the course of three journeys—in 1868 and again in 1887 and 1889

—it has been my good fortune to traverse the main chain of the Caucasus eleven times by eight different passes, and to cross in and out of Suanetia eight times by seven different routes. I have taken part in the first ascents of three of the great peaks, Elbruz, Kasbek, and Tetnuld, and of several lesser summits, as well as in many other glacier expeditions of greater difficulty than any of these ascents. My travels have led me, I believe, into almost every considerable glen at the foot of the main chain between Elbruz and Adai Khokh, and I have penetrated the pathless forests of the Skenis Skali and the Kodor.

The object of the present edition is to place my volumes within the reach of readers who object to heavy and costly illustrated works. I have not thought it expedient to revise or modify the original text. Nor do I feel called on to enter here into the many and minute questions of topography and orthography raised by Dr. Merzbacher in the two thousand pages in which he has recently recorded his travels in the Caucasus. To do so would involve much argument, hardly interesting to the general public. I gladly, however, take this opportunity to add the title of his work "Aus den Hochregionen des Kaukasus" to the list of books recommended in my Appendix.

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From Photographs by Signor V. Sella.

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CHAPTER I

THE DISCOVERERS OF THE CAUCASUS

The power of attaching an interest to the most trifling and painful pursuits is one of the greatest happinesses of our nature. HAZLITT.

IN the Old World of the West—the *orbis veteribus notus* of our atlases—the World of the Bible and the Classics—there were only two great mountain-ranges whose crests pierced into the region of eternal snow, and sent down streams of ice—those Miracles of Nature, as a mediæval scholar aptly called glaciers—among the forests and the corn-fields of the valleys. These ranges both rose at the farthest extremities of the civilised earth. The mountains that shadowed the homes, formed part of the daily life, and were woven into the enjoyment, the poetry, and the religion of the races who dwelt round the Midland Sea, were of a different type. The heights of Lebanon, the pathless crests of Parnassus, the deep glens and wide pastures of the Apennines[1] have little in common with the peaks, passes, and glaciers of the High Alps or of the Frosty

[1] The upper portions of the Apennines are in many cases wide pastures. They are, in Tuscany, locally known as *Alpi*, and Dante in more than one passage, I think, used the word in this sense. The primary meaning of the widespread term 'Alp' is everywhere 'high mountain pasturage,' and it was from its pastures or middle zone, and not from any primitive root denoting whiteness, that the range we call 'the Alps' got its name.

Caucasus. There is no region or zone in them which is not adapted for some human use; there are few heights which the shepherd and his flock may not climb in search of summer coolness. The less accessible crags and hollows were, indeed, looked up to for ages with a certain reverence as places on the borderland of the spiritual world, sites whence a god might issue his oracles, where a patriarch or a prophet might commune with the Infinite, or himself vanish into the Unseen.

The horror of great mountains and wild scenery among primitive people and in early ages has been, I think, not a little exaggerated by writers imbued with the literature of the last century, and the artificial taste which it expressed. In most of the religions and legends of the world mountains have held a large place. Their importance in Bible story was fully set out for the entertainment of the curious so long ago as A.D. 1606 by Rebmann, a Swiss pastor, who proved in a volume of rhymed verse, much to his own satisfaction, his thesis of the important part played by High Places in the dealings of God with man.[1]

The Greek, who gazed up from the river-plains and sea-beaches to the crests of Olympus, Taygetus, or Parnassus, associated them with the council-chamber of the gods, the home of Pan, or the haunt of Apollo. Mountains—his own mountains—held a large place on his horizon and in his mind. He peopled their groves and streams with airy spirits of human or semi-human shape; throughout his literature he played affectionately with these creatures of his imagination. Aristophanes could venture to embody and bring on the stage the Clouds. But the snowfield and the glacier had no place in the daily surroundings, and therefore no place in the common beliefs or fancies of the Hebrew or the Hellenic race. The snows had no local deities, unless, indeed, the Lares—the nature-spirits whose name still lingers in Tuscany and the Trentino in association with remote and uncanny corners of the mountains—took them under their protection.

Yet the eternal snows, if unfamiliar, were not altogether

[1] See J. R. Rebmann's *Naturae Magnalia. Ein lustig poetisch Gespräch von Bergen und Bergleuten.* Bern, 1606. 2nd edition, 1620.

unknown to the ancients, or outside their mythology. A few Greek merchant-adventurers had pierced the Symplegades, had followed the southern coast of the Euxine past the woods and cherry orchards of Kerasund to its farthest bay, had crossed the dangerous bar and pushed their prows against the swift grey flood of the Phasis.[1] They had brought back reports of a realm rich in natural fertility and mineral wealth, where the cities were embowered in orchards, the vines hung wild from the fruit-trees, and the rivers ran gold—gold which the natives secured by the simple device of leaving sheepskins in the mountain streams to catch the precious sediment they brought down.[2] And over the dark waves of the Euxine, or above the shadowy forests of the foot-hills and shining mists that rise from the marshes of the Phasis, these Greek mariners had seen at midsummer a strange sight, a silver indenture on the horizon, the 'star-neighbouring summits'[3] of the Frosty Caucasus.

The romantic tales of the Caucasus must have touched the Greek imagination much as those brought from the new regions beyond the Atlantic fired the fancy of our Elizabethan ancestors. And the great range soon found its *vates sacer*. Before any being more civilised than a dark Iberian or a long-limbed Gaul had looked up to the Alpine heights, Æschylus had secured for the remote snows of the Caucasus their place in the world's poetry. He had celebrated them as the prison of Prometheus, of the hero in whose gift of fire to his fellows was represented the first step in the progress of the human intellect from the level of the lowest savage to the arts of civilisation; the hero who, in his captivity, stood as the Protagonist of humanity against the apparently blind injustice of the Universe.

Æschylus had done something more. So little do poets know

[1] 'Rapidas limosi Phasidos undas,' writes Ovid, *Met.* vii. 6. Observe the accuracy of the epithets applied to a glacier stream.

[2] This practice, already noted by Strabo, is stated by more recent writers to have been continued in modern times on the Lower Ingur, the river of Suanetia.

[3] The Æschylean epithet may be illustrated by a coin of Dioskurias (the site of which, disputed by antiquarians, was probably somewhat east of Sukhum Kale) figured in Captain Telfer's *Caucasus*, vol. i. p. 124, on which are represented two mountain-tops (the summits of Elbrus?), surmounted by the stars of the Dioskuri.

to what uses they may come! He had made himself the instigator and guide of the first English mountaineers who visited the Caucasus.

As a child I had spent several summer holidays in the Alps. As an Eton boy I had reached the Sixth Form and the top of Mont Blanc at about the same period. When, in 1868, my Oxford terms were over, and I had a larger opportunity of indulging my love of mountain travel, the sonorous phrases of the *Prometheus Vinctus* were ringing freshly in my ears,[1] and I was possessed by an ambition to carry the methods of Alpine exploration, in which I had already taken some part, into a range which, though half in Europe and comparatively near home, was practically unknown, even to the leaders of our learned Societies. I was fortunate in finding three very congenial and capable companions, and together we were able to a great extent to dispel the obscurity which then overhung the recesses of the Caucasian chain, to reveal to our countrymen some of its many beauties, to take, in short, the first step towards converting the Prison of Prometheus into a new Playground for his descendants.[2]

Before going farther, let me clear away a frequent source of popular misunderstanding. The word Caucasus is commonly used in two distinct senses. It may be a term of political, or of physical, geography. It may cover the whole of the Caucasian Provinces, or it may be restricted to a mountain range that occupies only a comparatively small part of those Provinces. In the larger sense the Caucasus has, of course, been more or less well known in

[1] I may suggest to commentators that the story of Io's journey is much simplified if the ancient Korax, the modern Bsyb, is identified with the *ὑβριστὴν ποταμὸν οὐ ψευδώνυμον* of the poet. P.V. 736. Κόραξ was certainly a word connected with insults at Athens, and the Bsyb is still the most formidable and unfordable stream on the Black Sea coast. I wonder whether scholiasts will allow us to read Ἀβασίας for Ἀραβίας? P.V. 420. Ἀβασίας τ' ἄρειον ἄνθος Ὑψίκρημνον οἳ πτόλισμα Καυκάσου πέλας νέμονται. Procopius (*de B. G.*, Book IV., chap. ix.) describes the city-fortress of the Abasci in terms exactly fitting in with the poet's epithet! The fortress was taken and burnt by the Romans, but its ruins still exist near Sukhum Kale under the name of Anakopi. See Laurence Oliphant's 'Travels in Circassia' in vol. xii. of Blackwood's Series, *Travel, Adventure, and Sport.* But, on the other hand, Arabia and Circassia are reputed to have had ancient connections which were strengthened, not created, by the pilgrimage to Mecca.

[2] See *Travels in the Central Caucasus and Bashan*, by Douglas W. Freshfield. Longmans, 1869.

Europe for many centuries. Classical authors had already described its western seaboard. We read of Poti, in Hadrian's time, as surrounded by brick walls and furnished with war engines and a garrison of 400 men to preserve it from the attacks of the barbarians. When Arrian went there he saw an alleged memorial of the Argonauts—nothing less than Jason's anchor—exposed to view. He was critical enough to discredit the relic because it was of bronze, and he thought Jason's anchor must have been of stone! We can even catch glimpses of the snowy range, 'about the height of the Keltic Alps,' says Arrian, making a very fair guess. And he goes on, 'a certain peak of the Caucasus was pointed out (Strobilus is the peak's name) where, it is fabled, Prometheus was chained by Hephæstus by the orders of Zeus.' Strobilus—Elbruz we now call it—is still there, lifting its great pinecone-shaped mass over the crest of the central chain. Strabo and Pliny both tell us how the mountain tribes came over the passes to Dioskurias (near Sukhum Kale) by the aid of climbing-irons and toboggans. Such irons or crampons are still used, and an ancient one, dug up in one of the cemeteries of Ossetia, was given to me by M. Dolbesheff at Vladikavkaz. Similar foot-gear has been found in the Eastern Alps, together with other objects said to be attributable to a date not later than 400 B.C.[1]

In comparatively modern times, the number of travellers who have visited the Caucasus, and thought their experiences worthy of record, is prodigious. The *Bibliographia Caucasica*, published twenty years ago (1876) at Tiflis, is, though incomplete, a catalogue of 800 pages, and nearly 5000 entries, ranging from the stately folios of Chardin down to the half-crown booklet of the Boulevards and the scattered 'communications'—a sore trial to collectors and cataloguers—of the German or Russian Member of Scientific Societies. In point of date, Venetian travellers and Elizabethan merchants head the list. The Empress Catherine in the last century sent a *savant*, Guldenstaedt by name, to collect information about the mountain tribes and their languages, much of

[1] See *Mitt. des Deutschen und Oesterr. Alpenvereins*, 1892, No. 9.

which was published, with a map, in London in 1788.[1] At a more recent date we meet with one or two names famous in literature. To those who appreciate facts served up with a strong flavour of wit and romance, Alexandre Dumas, the elder, offers three very entertaining and picturesque volumes. The famous novelist, Count Tolstoi, has written some charming tales, based on the experiences of his early life and full of local colour. Those who prefer more solid fare may be recommended to consult the list given in the second volume of this work. Yet despite this mass of literature, 'the Caucasus,' in the limited sense in which the term is used in these pages, was, up to the middle of this century, even less known in Western Europe than the Alps were throughout the Middle Ages. Nothing had been certainly or accurately ascertained as to the structure or characteristics of the central range, the extent of its snows, the height of its peaks, the character of its passes, the relations of its groups, or the peculiarities of their scenery.

It is, or ought to be, obvious that a chain cannot be fully or scientifically described until its essential features above as well as below the snow-line have been discovered and examined. In this limited sense the members of the first Alpine Club party, that which I organised in 1868, may fairly be called the discoverers of the Central Caucasus. Before our journey no great peak of the chain had ever been climbed, and no pass over the range between Kasbek and Elbruz had ever been described, except from hearsay, in any book of travel.[2]

The mountaineers who have followed us—and as climbers so

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[1] *Memoir of a Map of the Countries comprehended between the Black Sea and the Caspian, with an Account of the Caucasian Nations and Vocabularies of their Languages* (anonymous). London: Edwards, 1788.

[2] The excellent reasons that exist for not believing in the alleged ascent of Elbruz in 1829 by a Cossack, named Killar, attached to an expedition led by General Emmanuel and described in Kupffer's *Voyage dans les Environs du Mont Elbrouz*, 1830, will be found stated at length by the Rev. H. B. George (*Alp. J.* vol. ii. p. 168), Mr. F. F. Tuckett (*Alp. J.* vol. iv. p. 167), by myself (*Central Caucasus*, p. 497), and by M. de Déchy (*Bull. Soc. Géog. Hongr.* vol. xiii. No. 3, and *Mitt. des D. und Œ. Alpenvereins*, 1885, p. 57. The 'ascents' of Kasbek of Wagner (1808) and Parrot (1811), recounted quite seriously in 1868 by German newspapers, were of the order of the 'ascensions du Mont Blanc jusqu'au Montenvers,' and their makers never claimed more than to have reached the snow-level.

far surpassed us—have played a part in Caucasian exploration similar to that played in the Alps by the first generation of the Alpine Club. But their work, it should be remembered, has been carried through in the face of difficulties and hardships far greater than those that were encountered by mountain climbers, even in Dauphiné, thirty to forty years ago. 'The Caucasus does not suit me,' grumbled a well-known Alpine guide; 'the valleys are too long, and the peaks are very high, and one cannot get to the top till late in the day, and has to come down in the dark.'

If I insist here on the substantial results of the travels of English climbers in the Caucasus in promoting a better knowledge of the chain,[1] it is not only as an answer to attacks that have been made on them by certain persons abroad—self-styled *Scientists*—who might have been expected to know better. I trust that nothing I may have occasion to say in these pages will be construed as implying any want of respect or sympathy for genuine scientific research or for those who pursue it in the mountains. My object is to promote genuine research by emphasising the necessary connection between mountaineering and the physical investigation of great ranges, to show that it is as impossible to explore thoroughly the heights of the Earth, without the aid of ice-craft, as it would be to explore the depths of the ocean without the aid of seamanship.

The founder of 'mountaineering,' De Saussure, recognised this connection and created—those who have studied the story of his life will know that I do not use too strong a word—the first school of glacier guides at Chamonix. It has been the occupation and delight of later men of Science to follow in his footsteps. Tyndall and John Ball were eminent equally in the Alpine Club and the Royal Society. Forbes and Agassiz employed the best guides and were themselves active climbers. It is no doubt unfortunate that the character of English education does so little to

[1] The number of the *Royal Scottish Geographical Magazine* for June 1895 contains an article on Suanetia by M. Dingelstedt, who believes that 'no descriptions of this country in English exist.' I may refer to it more particularly hereafter.

qualify our countrymen to use the many opportunities for physical observation their energy gives them. The majority of English climbers are, I admit, not physical observers. I am fully conscious of my friends', and even of my own, deficiencies in this respect. But whatever our shortcomings, we mountaineers have not darkened counsel with vain words, after the manner of the 'Scientist.'

USHBA

I must define a 'Scientist' as a person who bears to a Man of Science the relation that a poetaster does to a poet. It has been my frequent misfortune to come across specimens of this class. Geography, lying as it were on the Borderland of Science, is one of their favourite hunting-grounds. One of these gentlemen

once undertook to prove to me that there are no glaciers at all in the Himalaya. In the Caucasus there have been of late years not a few such 'specialists,' and their contributions to Caucasian literature have been considerable. They make the most of their own expeditions—generally failures—above the snow-level. Those who are more successful they describe as 'mere tourists.' They see very little; and what they do see is frequently out of focus. Their ignorance of mountain phenomena and the terms properly applicable to them often renders their narratives misleading. They constantly boast that their facts and descriptions are 'scientific,' forgetting that a statement which is neither accurate nor intelligible cannot be made scientific by any initials attached to the name of its author.

Enough of these pretenders who misuse the name of Science! I have dealt with some of them individually elsewhere. I need not waste my readers' time by pursuing in detail their divagations. The only errors I shall correct here are those into which serious students and writers of authority have been led in past years by the imperfect material at their disposal and the partial character of the exploration of the snowy chain. Let us turn back to some of the statements found in works of authority current at the date of my first journey. The 1860 edition of Keith Johnston's *Dictionary of Geography* contained these very remarkable assertions, the first of which was repeated in 1877 :—

'The mountains of the Caucasus are either flat or cup-shaped; the existence of glaciers is uncertain.'

The doubt as to glaciers was shared by Agassiz. The erroneous information as to the main features of the geological structure of the mountains given by Kupffer in 1830 was still current in 1868, and Sir Roderick Murchison was eager for information on this point. The existence of erratic blocks had been denied by Abich; and his assertion, after he had corrected it himself, was repeated by Tchihatcheff, a Russian traveller of considerable reputation. There was similar uncertainty as to the existence of mountain lakes or tarns,

even in the highest quarters. Mr. Darwin told me that in 1869 Sir Charles Lyell, holding my book in his hand, had greeted him with the exclamation, 'No lakes in the Caucasus!'

Some distinguished fellow-countrymen of our own had, no doubt, been among the mountains before us, but they had hardly, if at all, penetrated the central region, or above the snow-level. Their objects had been political; Bell and Longworth and Spencer had, between 1836 and 1845, while the hill-tribes were still struggling for independence, wandered to and fro in the western ranges among the mountains of Circassia and along the Black Sea coast. Mr. Laurence Oliphant, at the time of the Crimean War, had visited and vividly described portions of the same region; Mr. Gifford Palgrave, while Vice-Consul at Sukhum Kale, had ridden in 1867 to the land of the Karatshai, probably over the Klukhor Pass. But none of these writers had been in the Central Caucasus at all. At an earlier date Scottish missionaries were settled outside it at a place called Karass, near the Caucasian Baths, and one of them, Dr. Henderson, better known as the author of a work of Icelandic travel, published in 1826 a book containing what was, perhaps, the first attempt—I cannot say a successful attempt—to delineate Kasbek.[1]

This mission was founded in 1802, and dissolved by the Emperor Nicholas in 1835. It had a branch near Vladikavkaz. After more than twenty years' labours Dr. Henderson was compelled to report that little progress had been made. He quaintly adds: 'Were the temporal concerns of the colony entirely abandoned to the care of pious men of agricultural habits, and a sufficient number of able and devoted missionaries sent to labour among the Mohammedans in this quarter, a very considerable abandonment of the delusions of the Arabian Prophet might be expected to ensue.' The missionaries, however, found means to set up a printing press, and in 1807 published the New Testament in the old Turkish dialect spoken by the mountaineers, which is less mixed with Persian and Arabic

[1] *Biblical Researches and Travels in Russia, including a Tour in the Crimea, and the Passage of the Caucasus*, by E. Henderson. London: Nisbet, 1826. See also *Journal of a Tour from Astrachan to Karass*, by the Rev. William Glen. Edinburgh, 1822.

than that in use at Constantinople. Copies of this volume doubtless exist.

Sir D. Mackenzie Wallace, in his classical work on Russia, describes his visit to the site of the colony, and his encounter with a convert, a 'Scotch Circassian,' speaking the Lowland dialect, who informed him that his name was John Abercrombie. The missionaries, if they could not evangelise, seem to have done their best to Scotticise, the Caucasus. They even converted Elbruz into Allburrows!

From their home on the spurs of Beshtau our countrymen could watch the shadows pass over the snows of the great mountain, and dawn and evening paint its double crest, but they could not even approach its base. Up to 1820 the fierce tribes of the Karatshai prevented any attempts to penetrate their fastnesses. Dr. Abich, writing in 1854, states that no traveller had up to that date visited Suanetia. The highroad through the Darial was the only track open to traffic across the main chain.

In the northern valleys of the Central Caucasus, our earliest predecessors, other than Russian officials, were the German ethnologists, Klaproth (1808), and Wagner (1843). They confined themselves mostly to their special pursuit, and when they approached the snowy region their descriptions become so general that competent critics are still in doubt how much of their narratives may be based on hearsay, and how much on actual experience.

Our immediate forerunners in the exploration of the central chain were also two Germans, who were in the employment of the Russian Government, and resided at Tiflis, where I had the good fortune to meet them both in 1868.

The correspondence of Dr. Abich, which has recently (1895), been published, shows the extent of his wanderings in the upper valleys. He had visited most of them, including Suanetia, before 1865, and had measured the lower extremities of several of the glaciers. He saw Koshtantau in 1849 from the heights between Balkar and Bezingi, and heard it called Dumala Bashi. But he kept to himself all but a few facts and figures. Dr. Abich was

at heart more a man of science than a man of letters. He writes to his wife in 1863: 'I would rather float with so many others down the stream of oblivion than run any risk of loading the vessel of science with useless ballast, in the place of accurately verified observations. What is the value of showy maps and pretty drawings which only serve to stereotype errors which posterity will be called on laboriously to set right?' Dr. Abich carried this resolution into practice. Writing to his relations during a visit to London, he informs them that Mr. Murray was prepared to guarantee him 'several thousand pounds' for the translation of a work on the Caucasus. But even this belief failed to spur him to produce such a volume. He delayed till his last years publishing the results of his wanderings, and then issued only the observations made in the Armenian Highlands. At his death in 1886 his geological map of the Caucasus remained an unfulfilled project, and the fruits of his travels in the main chain are to be found only in a few scattered pamphlets.

Dr. Radde, a North German by birth, has, both by his continuous travels and by his energy in organising the Caucasian Museum at Tiflis, of which he is still the Curator, done more than any man living to spread abroad a sound knowledge of the country he has made his home. A distinguished botanist and an indefatigable traveller, he has turned his attention to many branches of research, and recorded his observations in several volumes as well as in numerous contributions to *Petermann's Mitteilungen*. A lifetime devoted to the intelligent observation of obscure regions may be more valuable to science than a single brilliant exploration, and the honours Dr. Radde has received in this country and elsewhere have been fully earned. He has done all that was possible for a man without ice-craft. Had he succeeded in breaking the charm that guards the secrets of the snow-world, had he created a school of glacier guides among the native hunters, he might have made himself the De Saussure of the Caucasus. As it is, although his work will ever be held in high estimation by serious students, he will leave behind him a scientific reputation rather than a popular name.

The communications of these German doctors did not reach Europe until 1868, and then they were confined to Germany. For at that time the Council of our Royal Geographical Society had not yet seen its way to fulfil one of its most obvious functions, and despite the individual efforts of Mr. Clements Markham and the late Mr. H. W. Bates, England was still without any magazine for the diffusion of general geographical information comparable to Petermann's famous *Mitteilungen*.

Where books are wanting the intending explorer may often find a most useful and suggestive friend and companion in a map. It was on a German map—Koch's General Map of the Caucasian Isthmus—that Moore and I planned out our journey in 1868. On that map Dykhtau and Koshtantau were not marked. The ridges between the sources of the Rion and the Ingur were very vaguely delineated. But no better map was to be had in Western Europe. It was not until after we had landed in the Caucasus that we learnt that between 1847 and 1863 the Russian staff, under the direction of General Chodzko, had executed a survey of the Caucasian Provinces and part of Armenia, which resulted in the atlas, known from the scale on which it was published—five versts or three miles to the inch—as the Five-Verst Map. The necessary sheets of this atlas were first shown us by Count Levashoff, then the Governor of Kutais, and afterwards placed in our hands at Tiflis by the courtesy of General Chodzko himself.

The Russian surveyors did their work under the greatest difficulties—difficulties which at times took the shape of a shower of bullets. As far as their means and their instructions carried them, they did it adequately. They laid down with surprising accuracy and completeness the general features of the ground below the snow-level, and outside the hidden recesses of the range. They produced an excellent delineation of the habitable country and the practicable bridle-paths. They indicated precisely the extent of forests and the positions of villages and bridges. They were employed for military and administrative purposes, and not for natural research. To have delayed issuing their map until they had made the survey physically

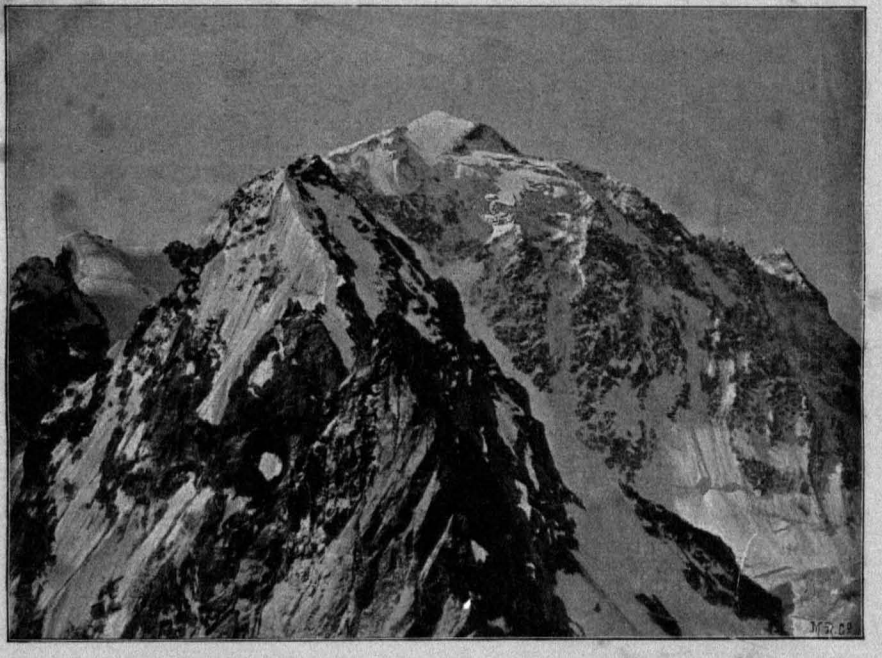
complete would have been, under the circumstances, impossible.[1] Accordingly, they were content to fix trigonometrically, mostly, if not altogether, from the northern side, the heights and positions of a few prominent summits. They discovered, and General Chodzko, through *Petermann's Mitteilungen*, communicated to the western world the existence of the three great peaks which they named Dykhtau, Koshtantau, and Adai Khokh. But they omitted altogether Dongusorun, Ushba, Tiktengen, Tetnuld, Janga, Shkara, Ailama and Burdjula—in short, all the peaks that are not conspicuous from the northern steppe. The frozen fastnesses were in most cases represented by conventional signs; a blue smear here and there served as an indication of glaciers, and above the snow-level a number of brown ridges were laid down without much care, in some cases with no care at all, as to their correspondence with nature. In taking this course the surveyors followed the precedent of the first staff-maps of the Alps, except those of the Swiss Government.

Government surveyors do not, I think, always realise fully their responsibility to Science. It might be better in most cases if country not at all, or imperfectly, surveyed as to topographical detail were left blank, or at least distinguished in some striking manner from the more authentic portions of a map. For not only the public, but also its teachers, naturally accept a government map as equally authoritative in every part. Even a scientific traveller may easily fall into the same mistake.

The literature of the Caucasus furnishes a striking instance of the confusion and darkening of knowledge that may thus be wrought. The defects of the five-verst map have raised up a crop of delusions that are far harder to eradicate than simple ignorance. In

[1] There is in the Royal Geographical Society's Library in Savile Row a curious tract issued in 1863 by General Chodzko, giving some account of his twenty-five years' labours. At times his officers worked under the fire of hostile villagers. Nor were they less brave in facing natural difficulties, so far as their means availed them. The General camped for several days on the top of Ararat; he climbed Zilga Khokh, a peak of 12,645 feet on the watershed south of Kasbek, in order to connect his Ciscaucasian and Georgian stations. More than this without ice-craft he could not do. It is curious that none of the great peaks were triangulated from stations south of the chain. This is the reason why the mountains on the watershed, including Tetnuld, Ushba, and Shkara, escaped notice. See also notes by General Chodzko in the years 1859 and 1862, in *Petermann's Mitteilungen*.

1868, the year of my first visit, and again three years later, in 1871, M. Ernest Favre, then a young Genevese geologist, a son of the well-known writer of the same name, travelled in the central range, and on his return published a small volume and a geological map. M. Favre did wonders in the time and with the opportunities at his disposal: his map was an immense addition to our knowledge; his geological and orographical observations were most valuable. His



KOSHTANTAU, FROM ABOUT 14,600 FEET ON ULLUAUZ BASHI.

work remains the chief and most trustworthy source of information on his special subject. But not being a mountaineer himself, and having no ice-craft at his command, the glacier region necessarily remained as much a *mare clausum* to him as the Palæocrystic Sea has proved to the British Navy. Consequently, he had to go for his facts, or ideas regarding it, to the government map. Finding this map accurate below the snow-level, he readily accepted it as a true picture of the region above the snow-level, to which he had not himself penetrated. The next step followed almost as a matter

of course. M. Elisée Reclus, the encyclopædist of geography, to whom that Science owes as much as to any living writer, naturally went for his information with regard to the Caucasian glaciers to a geologist of standing rather than to a 'tourist.' The passage below, copied almost word for word from M. Favre, occurs in the English edition of M. Reclus's monumental *Géographie Universelle*:[1]—

'Although with a greater mean elevation than those of the Alps, the Caucasian peaks are far less covered with snow and ice, not only in consequence of their more southerly latitude and other climatic conditions, but also owing to the narrowness of the upper crests and the absence of cirques, where the accumulated snows might serve as reservoirs of glaciers. . . . The absence of snow produces a corresponding scarcity of glaciers.'

Now, in this quotation, I am obliged to traverse, one by one, the premises—except the statement as to latitude, as well as the conclusion. The climatic conditions are favourable to glaciers—that is, the snowfall in the Central Caucasus is heavier than in the Central Alps; the crest is broad and has a number of high spurs, which enclose extensive and well-filled snowy reservoirs, the source of many and great glaciers.

M. Reclus gives, as physical maps illustrative of his statements, extracts from the five-verst survey of Kasbek, Elbruz, and the chain north of Suanetia. These are unfortunately false to nature, and have been proved to be so, first by the perambulations of mountaineers, and more recently by the one-verst survey now in progress.

In one of the most original and instructive studies of the nature and effects of existing glaciers, by a writer of deservedly high authority, Professor Heim of Zürich, we are met by similar inaccuracies.[2] I need only mention the most startling. We find the author stating that there are 46 square miles of snow and ice in the whole Caucasus, of which half are on Elbruz. According to the new government survey, the glaciers on Elbruz alone cover about 83 square miles, and those of the chain, including Elbruz,

[1] Vol. vi. p. 40, of the English translation. All the heights assigned to peaks in the English edition are computed wrongly. Vol. vi. p. 36.

[2] *Handbuch der Gletscherkunde*, von Dr. A. Heim. Stuttgart, 1885.

from the Jiper Pass, to the Darial Road, not less than 625 square miles.

This unconscious propagation of error shows no sign of coming to an end. In vain, it would seem, have I been engaged for years in setting out, to the best of my ability, in the *Alpine Journal* and the *Proceedings* of the Royal Geographical Society, the physical facts ascertained by my friends and myself, or by the labour of the officers employed under General Shdanov while putting together the material for a new map. In vain has M. Mikhailovsky, in the *Proceedings* of the Moscow Naturalists' Society, recently taken up the same task with great care and industry, if with some lack of local experience.[1] We find a new, and in many respects excellent guide and road-book to the Caucasus, issued in 1894 at Paris, reproducing from Reclus old scraps of the five-verst map, and particularly those parts of which M. de Déchy and I had years before most clearly demonstrated the entire inaccuracy! The author, M. Mourier, is consistent, for he borrows also from Reclus's *Géographie* the passage I have already quoted with regard to the formation of the chain and the extent of its *névés*.

The repetition of errors, although for the purpose of correction, is an ungrateful task. To the minor writers already referred to in general terms, I have purposely paid no attention: acting on the principle *corruptio optimi pessima*, I have dealt only with authors of eminence and deserved authority. Enough probably has been said to convince my readers that an accurate account of the peaks, passes, and glaciers of the Central Caucasus is called for, and that, if I correct some previous authors, I do so with good reason. Amongst my corrections will be several of errors into which I have myself fallen. The evolution of Caucasian orography has necessarily been gradual; and it is still in progress. My successors will doubtless find many facts to add to those brought forward in these volumes, and not a few mistakes to put right both in my text and map.

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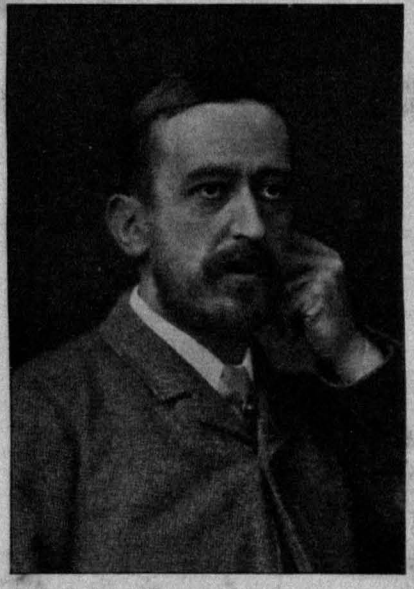
[1] See *Alpine Journal*, vol. ix. p. 182; xi. p. 471; xii. p. 320; xiii. pp. 353, 499; xiv. pp. 1, 314, 436. *Proceedings of the Royal Geographical Society* (N. S.), vol. x. pp. 325, 677; xi. p. 351; xii. p. 257; xiv. p. 100. *Bulletin de la S. I. des Naturalistes de Moscou*, 1894.

Twenty-eight years ago, in 1868, I first went to the Caucasus with two companions, Mr. Comyns Tucker, afterwards a Fellow of University College, Oxford, and the late Mr. Adolphus W. Moore, C.B., of the Political Department of the India Office, a public servant of rare ability and a true-hearted and unfailing friend, whose premature death, in 1887, was felt as a national as well as a private loss by all who had come intimately into contact with him. We took with us a Chamonix guide, François J. Dévouassoud, the first Alpine guide to carry his ice-axe to the snows of a distant range. In the course of our journey Kasbek and Elbruz,[1] the only two peaks of the Caucasian chain that were then known to fame in Western Europe, were climbed for the first time. We visited the more important valleys between them on the south side of the range, obtained some idea of the importance of the Central Group, and brought to light the existence of a number of great peaks. Travel in the mountains was at that time difficult, and some of the most attractive districts were still far from safe. In 1875 Mr. F. Craufurd Grove published his *Frosty Caucasus*, a very lively and interesting account of the first ascent of the western, which has proved to be slightly the higher, of the two cones of Elbruz, and of a tour through the heart of the mountains, made in the previous year by himself, my former companion Mr. Moore, Mr. Horace Walker, and Mr. Frederick Gardiner, with Peter Knubel, a Zermatt guide. The party crossed the main chain by



A. W. MOORE, C.B.

[1] *Travels in the Central Caucasus and Bashan.* Longmans, 1869.

the old pass near the source of the Rion, visited the northern glaciers of the Central Group and the western flanks of Elbruz, and descended to the Black Sea over the Nakhar Pass, and through the forest-wilderness of the Kodor, where they all had the misfortune to catch the fever of the country.

Wars and rumours of war intervened, and it was not for some years that English mountaineers again looked eastwards to the confines of Europe and the summits of the Caucasus.

Meantime M. de Déchy, a Hungarian gentleman, took up the task of exploration. In 1884, 1885, and 1886, he made three extensive journeys in the range. In 1884, accompanied by two Swiss guides, one of them the well-known Alexander Burgener of Saas, he climbed Elbruz and a fine peak near the Mamison Pass. In the course of his wanderings he made the first passage by travellers of several native glacier passes and collected a considerable amount of scientific information with regard to the glaciers and the snow region. He also took a very large number of most valuable photographs of the scenery and people, thus making himself the pioneer in Caucasian photography. I am indebted to him for some of the most interesting illustrations in these volumes.

In 1886 Mr. Clinton Dent and Mr. W. F. Donkin, with Burgener and Basil Andenmatten, made a rapid onslaught on the snows from the northern side, and, following Mr. Grove's suggestion, climbed one of the peaks of the Central Group, named Gestola, 15,932 feet in height.[1]

In 1887 M. de Déchy joined company with me for a short journey. I had with me François Dévouassoud and two of his relatives, Chamonix guides. We crossed together two high passes over the main Suanetian chain, and I climbed several summits, amongst them Tetnuld (15,918 feet), the beautiful peak which lifts its silver horn above the forest glades of Suanetia.[2]

The year 1888 was marked by great mountaineering activity and success, and by a most lamentable catastrophe. The late Mr.

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[1] *Alpine Journal*, vol. xiii. pp. 220 and 242. Mr. Dent, mistakenly, at first called the peak he climbed Tetnuld.

[2] *Proceedings of the Royal Geographical Society*, New Series, vol. x. pp. 325 and 677.

A. F. Mummery, with H. Zurfluh of Meiringen, scaled the great southern cliff of the second peak in the Caucasus—if, indeed, Dykhtau's slight advantage over Shkara is authentic—and explored the passes at the heads of the Bezingi and Bashilsu Glaciers.

A second party, Mr. Holder, Mr. H. Woolley, and Mr. Cockin, with Ulrich Almer of Grindelwald, climbed Dykhtau by its northern ridge, Katuintau and Salynan Bashi, and almost climbed Mishirgitau, and Mr. Cockin, who remained behind his companions, had the extraordinary good fortune to add to his trophies Shkara, the eastern peak of Janga, and the northern peak of Ushba.

The third party consisted of Mr. Clinton Dent, Mr. W. F. Donkin, and Mr. H. Fox, with K. Streich and J. Fischer of Meiringen. Owing to indisposition, Dent was forced to leave his companions in Suanetia. Donkin and Fox, with their two guides, climbed the eastern peak of Dongusorun, and, after forcing a fine glacier pass over the Urubashi spur, made their way along the northern side of the chain to the foot of Koshtantau. They left their camp and interpreter in the Dumala glen, four hours from Bezingi, with instructions to meet them in a few days at Karaul, in the Balkar district. They were never seen or heard of again. Their fate was wrapped in mystery, and became not unnaturally the subject of wild conjecture in the country. The local officials suspected foul play, and some of the hangers-on of officialism were perhaps too ready to adopt a belief by which they may have had something to gain.

In 1889 Mr. Clinton Dent and I, with the assistance of Mr. Hermann Woolley and Captain Powell of the Indian Army, set out with three Alpine guides and Andreas Fischer, the brother of the lost guide, to ascertain, as far as might be possible, the fate of our friends. The story of our Search Expedition, of Mr. Woolley's ascents of Koshtantau and Ailama with Christian Jossi, and of Captain Powell's and my subsequent ascent of the Laila and journey through the forests of Abkhasia, will be found in subsequent chapters.

In 1890 the Adai Khokh Group was made the principal field of exploration. Mr. Cockin, Mr. Holder, and Mr. Mummery, with Mr. W. J. Petherick, took part in it. Adai Khokh, Burdjula, and Zikhvarga were climbed and photographed.

In 1891 two German climbers, Herr Merzbacher and Herr Purtscheller, with two Tyrolese guides, made an extensive tour, in the course of which the three summits of the Laila, Tetnuld, Dongusorun, the northern Adyrsu Bashi of the one-verst map (first ascent), the eastern peak of Janga and Gimarai Khokh (first ascent) were climbed, and Kasbek reached for the first time from the head of the Genaldon Valley, by a route meeting the Devdorak route on the great snow-field north of the summit.

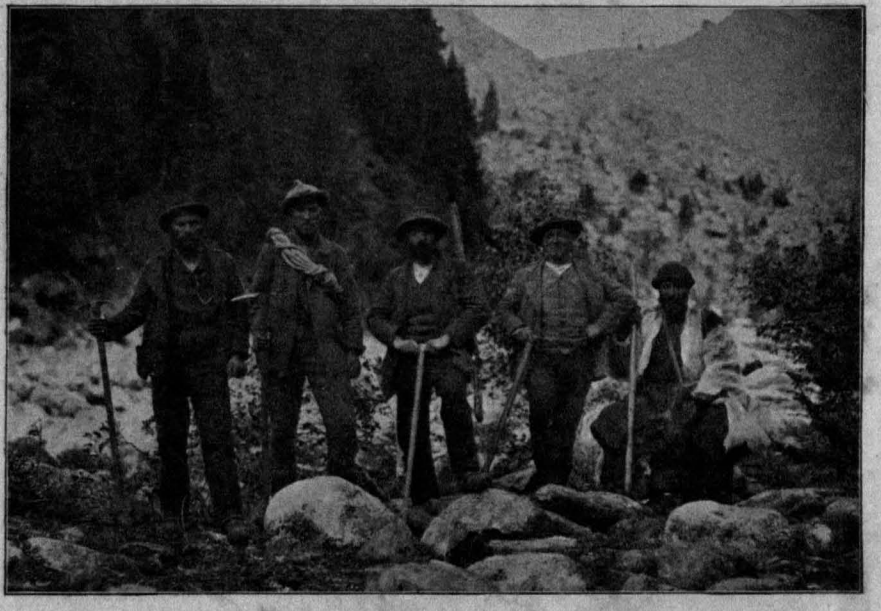
In 1893 four Englishmen, Mr. Solly, Mr. Woolley, Mr. Newmarch, and Mr. Cockin, and in the following year Mr. Solly and Mr. Newmarch, with Mr. Collier, visited Suanetia. Their climbs are duly chronicled in the Appendix to these volumes.

In 1895 Mr. Clinton Dent and Mr. Woolley again visited the Caucasus, in company with Mr. M'Cormick, an artist who had previously been with Sir W. M. Conway in the Karakoram. The ascent of Ziteli, the second summit of the Laboda Group, from the Urukh Valley, was their chief climb. The results of their journey were mainly photographic and artistic. Mr. Cockin and Mr. Newmarch were once more drawn to Betsho, and pursued their protracted courtship of the southern peak of Ushba without meeting with any reward for their constancy.

I have left to the last the journeys of Signor Vittorio Sella, my fellow-labourer in the preparation of this work. In 1889 he made, with his younger brother Erminio, a long journey in the mountains: and in 1890 he returned to them, taking with him three Italian farm-servants to carry his photographic apparatus. He climbed, besides Elbruz and the Laila, three high summits, Burdjula, Zikhvarga, and Ulluauz Bashi. But his distinguishing success was in the work that gives their chief value to these volumes. He has illustrated the Caucasian snows as no distant glacier chain has ever been illustrated before. With the help of his sturdy Piedmontese followers, he carried his camera and his glass-plates to elevations of over sixteen thousand feet, and brought back with him images, not only of the valleys and their people, but of the summits and their vast mountain panoramas. He anticipated the Russian surveyors in correcting the representation of the Suanetian glaciers on the five-verst map.

This catalogue, ruthlessly abbreviated as it has been, is perhaps long enough to be tiresome. It seemed necessary, however, from my point of view, to indicate, once for all, how much has been done in the last quarter of a century by *mountaineers* to elucidate the topography and characteristics of the snowy region of the Central Caucasus.

During this period the lower grounds, the valleys and horse-passes, have not been neglected by general travellers, several of



SIGNOR SELLA AND HIS MEN

whom have contributed to Caucasian literature. If I do not include them in my list of mountain explorers, it is not from any disposition to underrate the interest of their travels. I give elsewhere a list of the more important of these authors. I need only mention here, among our countrymen, Captain Telfer, R.N., an ardent archæologist, and Mr. Phillipps-Wolley, equally eager as a sportsman. M. de Bernoville's handsome volume contains much that is interesting with reference to Suanetia and its antiquities. M. Chantre's ethnological studies have, by the liberality of the French Government, been embodied in a monumental work. Signor Lerco, a

Piedmontese, has given an account of an ascent of Kasbek by the buttress opposite the post-station made by him in 1887. M. Ivanoff has recounted a vain attempt to ascend Elbruz. Two other Russian travellers, Messrs. Iljin and Dinnik, visited the lower ends of several glaciers, and published in *Petermann's Mitteilungen* instructive accounts of their travels.[1] Professor Kovalevsky and

RUSSIAN SURVEYORS AND ENGLISH CLIMBERS

Dr. Radde have studied on the spot the primitive laws and customs of the mountain tribes.

In 1890 the distinguished botanist, M. S. Sommier, with M. E. Levier, visited Suanetia, and traversed the Forest of Darl and the Klukhor Pass. M. Levier has described their adventures and discoveries in a most entertaining volume, full of valuable botanical information.

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[1] *Petermann's Mitteilungen*, vol. xxx., 1884.

It would be very ungrateful to leave out in this enumeration of the contributors to our accurate knowledge of the Central Caucasus the Russian engineers who have been charged with the mapping of the chain.

About 1880 an entirely new survey of the Caucasian Provinces was undertaken by the Government. I had, in 1889, opportunities of making the personal acquaintance of two of the officials—they belong to a civil and not a military service—entrusted with this task, Messieurs Jukoff and Bogdanoff, and of appreciating on the spot their zeal and patience. Another of the surveyors, M. Kovtoradze, distinguished himself in 1891 by following Mr. Holder's party to the top of Adai Khokh. Elbruz had been reached in 1890 by M. Pastukhoff, of the Survey, and Kasbek was in 1889 climbed by a resident at Tiflis, who had the boldness to describe his expedition as the 'first authentic ascent of the mountain.'

As a whole, the new survey promises to be excellent. Some of the earlier sheets have not as yet been brought up to the general level. The surveyors went from one extreme to the other: they exaggerated at first, almost as much as their predecessors had diminished, the extent of the snows; they paid no attention to the spurs that subdivide the glacier basins. But in the more recent, and by far the larger portion of their work, this tendency has disappeared. There is little fault to be found with most of the sheets placed in my hands by the courtesy of General Kulberg. Here and there, perhaps, some glacier recess, invisible from any valley, and only accessible by dint of ice-axes, has been vaguely and inadequately depicted. In all such cases I have ventured, in the map issued with these volumes, to make, as far as the scale allows, what seem to me the necessary corrections.

Of the predecessor of this map, a large diagram I prepared with no slight labour ten years ago for the Geographical Society, I wrote at the time as follows:—

'The sketch map shown, though in some parts without pretensions to scientific accuracy, gives a fairly truthful representation of the heart of the Caucasus. It indicates the complex character of the snowy chain, its numerous spurs, how the glacier basins are distributed, how the ridges

encircle and divide them. The mountains east of the Mamison Pass are laid down from the new survey. Mr. Donkin has, by means of numerous magnetic bearings and photographs, depicted with considerable accuracy the great Bezingi Glacier. M. de Déchy has provided me with a mass of photographs. For the rest, I have had materials of my own, in bearings and sketches taken from many lofty standpoints. Thirty-six sheets of topographical notes are embodied in that map.'

This work has been in some points superseded, but it has served its purpose. The map which I am here able to produce owes no doubt its general scientific precision almost entirely to the observations taken during the last ten years by the officers charged to re-survey the great chain. It would be difficult to speak too highly of the zeal and industry of several of these cartographers. But it may be permissible to believe that the sympathy and appreciation their work has met with on the spot, the suggestions and criticisms that have been exchanged in mountain camps between them and Alpine explorers, have afforded some help and encouragement to our Russian friends in their labours. Owing to the delay in the formal publication of the new survey, which is on the large scale of one-verst to the inch, these labours have as yet met with but limited recognition, even in Russia. M. Golovievsky, who was responsible for the Elbruz sheet, the only one yet officially published, has, I understand, received honours from the geographers of St. Petersburg. When the importance in the orography of the chain of the Central Group, and the difficulties involved in its accurate survey, are appreciated at a distance, there can be but little doubt that the work of other officers will be duly noticed in their own country.

My only serious difference with the surveyors is in the very knotty question of nomenclature. It is the general experience of travellers that the names given on the new maps are in many instances not those commonly in use among the people of the country. In some they are obviously clumsy. Dongus-orun-cheget-kara-bashi, 'The head of the black ridge of the place of pigs'—the name applied to one of the summits visible from Urusbieh—is too much of a mouthful for every-day use. And in one now famous instance

we bow most reluctantly to the decision of the new survey. The second and fourth peak of the chain, the two highest summits of the great spur of the Central Group, the Dent Blanche and Weisshorn of the Caucasus, were named Koshtantau and Dykhtau by the makers of the five-verst map, and for a quarter of a century these names had held their place in geographical literature and tales of mountain adventure. It was on the Dykhtau of the five-verst map that Donkin and Fox met their fate. These names have been reversed in the still unpublished new sheets, on the ground of local usage. All our remonstrances, on the score of convenience or sentiment, against the change have been fruitless. There is no Court of Appeal from the official verdict. Henceforth Dykhtau must be Koshtantau, and *vice versâ*. We English mountaineers submit, but we do so with infinite regret.[1]

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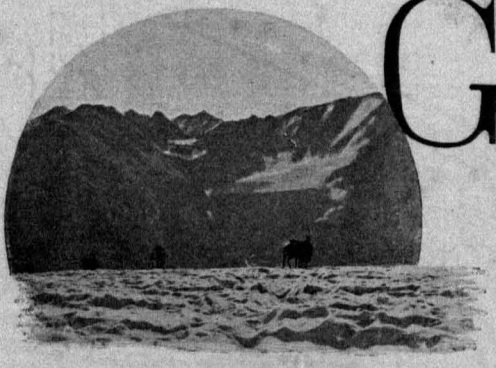
[1] Those who read Russian will find a mass of information relating to the Caucasus in the ten or more volumes entitled *Materials for the Study of the Caucasus*, issued by M. Janovsky at Tiflis since 1885. The best general description of the Caucasus in English is that contributed to the *Encyclopædia Britannica* (1875) by one of the early members of the Alpine Club, the well-known geographer, Mr. Edward Bunbury.

CHAPTER II

THE CHARACTERISTICS OF THE CAUCASUS

Why are comprehensive works adapted for the general reader and student of nature to be replaced entirely by studied monographs connected with some single science in some single district? PRINCIPAL JAMES D. FORBES.



GENERAL chapters are apt to be dull. Yet some sort of framework must be provided for the pictures of travel and adventure to follow. The obsolete fiction I have undertaken to get rid of has to be replaced by more correct information. I shall do my best to convey it in a compact and convenient form—dealing here broadly with the outlines, and only indicating the local colours. Topographical details, such as are called for by the explorer and the mountaineer, I shall reserve for an Appendix, where they will not only be accessible to him, but also avoidable by the ordinary reader, who has no time and small patience for such matters.

Let us, with a general map before us, glance, as quickly as possible, at the elements of Caucasian orography. The really mountainous part of the chain, from Fish Dagh on the west to Basardjusi on the east, is over 400 miles long, a distance about equal to that between Monte Viso and the Semmering in the Alps. Its skirts stretch out for another 150 and 100 miles respectively to the neighbourhoods of Baku, on the Caspian, and of Novorossisk, the

new Black Sea corn-port of Ciscaucasia. It runs from W.NW. to E.SE., between latitudes 45° and 40° N., its centre being in the same parallel with the Pyrenees. The snowy range—'the frosty Caucasus'—which begins north of Pitzunda on the Black Sea, stretches without interruption to the eastern source of the Rion, the ancient Phasis. Between the Klukhor and Nakhar Passes and the Mamison Pass—that is, for 100 miles, a distance as great as from the Col de la Seigne to the St. Gotthard—there is no gap under 10,000 feet; no pass that does not traverse glaciers. Continuous no longer, but broken by gorges, one of which is the famous Darial, the snowy central crest stretches eastward, culminating in the glacier groups of Kasbek (16,546 feet) and Shebulos (14,781 feet). East of the historical pass of the Caucasus —commonly known as the Darial, but more correctly as the Krestovaya Gora, or Mountain of the Cross—the mountain ridges diverge, enclosing between them the barren limestone plateaus and yawning ravines of Daghestan—'the Highlands,' as the name implies. The valleys round Tebulos have been described by Dr. Radde in his work on the Chevsurs. Its glaciers, as well as those of Bogos, have been recently explored, climbed, and photographed by a German mountaineer, Herr Merzbacher. Judging from his views, the forms of the peaks are less bold, and the scenery as a whole is less varied than in the Central Caucasus. The range that forms the southern boundary of Daghestan, and shelters the rich forests and orchards of Kakhetia, is tame in outline though high in general elevation, and only becomes picturesque and interesting in the neighbourhood of the broad basaltic cliffs of Basardjusi (14,635 feet), a mountain which has lately been climbed and described by Mr. Yeld and Mr. Baker.[1]

This eastern half of the chain, despite its three glacier groups, Tebulos, Bogos, Basardjusi, lies outside my field of view. It will no doubt be fully dealt with in the volume promised by Herr Merzbacher. We must be content here to concentrate our attention on the part of the Caucasian chain between Elbruz and Kasbek. That

[1] *Proceedings of the Royal Geographical Society*, vol. xiii. p. 313. *Alpine Journal*, vol. xvi. p. 1. See also Dr. Radde's paper in *Petermann's Mitteilungen*, Ergänzungsheft 85.

portion is 120 miles long—as long as from Mont Blanc to the Rheinwaldhorn. From Naltshik to Kutais it is 100 miles broad; in its narrowest part about 80 miles broad. A hundred miles is about the breadth of the Alps from Grenoble to Turin, Chambery to Ivrea, or Lucerne to Arona. Contrary, therefore, to what has often been stated, the Central Caucasus is slightly, but not very much, narrower than the Alps.

It is essential to an understanding of the characteristics of the Caucasus, to an appreciation of Caucasian scenery, even to the planning of Caucasian tours, that some correct idea should be formed of the geological structure of the chain—at any rate, in its main features. If the zone covered by mountains is nearly as broad as in the case of the Alps, the orographical detail is much simpler. Nowhere in the central chain are there more than thirty miles in a transverse section between the outstanding snow-peaks. There are about fifty miles between the Wetterhorn and Monte Rosa, or the Silvretta and the Adamello.

I accept the theory, which has gained ground of late years, that mountain ranges indicate lines of weakness in the Earth's crust, and that their elevation is caused by its contraction. The Alps would appear to be the result of successive and very complicated Earth movements. The Caucasus, by its more uniform structure, may suggest rather a single if prolonged effort, whereby the central core of gneiss and granite has been raised, and the successive layers of crystalline schists, slates, limestone, and cretaceous rocks thrown up against its flanks.

The key to a correct understanding of much Caucasian orography may be found in the recognition that the geological axis of the chain and its water-parting are in many places not identical. The granitic axis emerges from under the waves of the Black Sea, some distance west of Sukhum Kale. If a line is drawn along its centre in the accompanying geological map, it will be seen to form a series of gentle curves, and to coincide, *in the main*, with the watershed as far as the Mamison Pass. I qualify my statement because, east of Dongusorun and again above the Skenis Skali sources and the western source of the Rion, the dividing ridge is for a short space

composed of friable crystalline schists. This fact, which, as far as I know, has not yet been noticed by geologists, has very important practical effects. The chain in these portions is without conspicuous peaks and crests for a few miles, and is traversed by relatively easy and frequented cattle-passes.

The granitic main chain is not accurately described as a single wall. Nor are the same peaks, as a rule, conspicuous from the steppe and the southern lowlands. Dykhtau and Koshtantau are seen from Piatigorsk on the north, standing out on a bold spur which generally conceals Shkara and Janga. The Adai Khokh group, so conspicuous from the heights of the Lower Rion, is hidden from the north-west by the Bogkhobashi range north of the Urukh.

The central chain of the Caucasus, when studied in detail, recalls the features of the Pennine Alps. It consists of a number of short parallel, or curved horse-shoe ridges, crowned with rocky peaks and enclosing basins filled by the *névés* of great glaciers, the Karagom, the Dykhsu, the Bezingi, the Zanner, and the Leksur. I name only a few of the greatest. In its double ridges, with vast frozen reservoirs between them, it resembles the group of Mont Blanc; it has lofty spurs, like those of the Saasgrat and the Weisshorn. On either side of the main chain the same succession is repeated, with one important difference. On the north the schists come first, sometimes rising into peaks and ridges in a state of ruin most dangerous to climbers—a fact indelibly impressed on my memory—but more often worn to rolling downs; then the limestone range—writing-desk mountains that turn their steep fronts to the central snows; lastly, low cretaceous foothills, that sink softly into the steppe. But on the south side the crystalline rocks are succeeded by a broad belt of slates, as to the age of which the evidence is at present conflicting and the opinion of geologists divided.[1]

East of Adai Khokh, by what seems a strange freak of nature, the granitic range is rent over and over again to its base by gorges, the

[1] See Professor Bonney's Note to the Geological Map, Vol. ii. Appendix A.

watershed being transferred to the parallel chain of clay slates—'palæozoic schists' they have, apparently without conclusive reasons, been termed abroad—which has followed it from the Black Sea, attaining on its way the height of 13,400 feet in the Laila, and limiting the great parallel basins of the Rion, Ingur, and Skenis Skali. The how and why of this transfer of the watershed I leave to professional geologists. Its historical importance has been great. The slates, less steep, less lofty than the granite, are also far less formidable obstacles to traffic. The Krestovaya Gora—or Cross Mountain Pass—traverses them at less than 8000 feet; the Mamison Pass slips over the grassy ridge that links them to the granites of Adai Khokh at a height of 9200 feet. These are the natural highways from the north to Georgia and Mingrelia respectively. The former has long been the Georgian military highroad; the latter was opened for wheels in 1889. They are easy passes—so easy that it was not on the mountain crest, but where, in the gorge of Darial, the granitic range is cleft to its base, that Chosroes and Justinian combined to raise and garrison a frontier fortress between the old civilisations of the world and the legendary hordes, the Gog and Magog, of northern barbarism. Between them half a dozen gaps, leading from the head-waters of the Kur to those of the Ardon, a tributary of the Terek, are frequently traversed by the Ossetes, whose position astride the chain enabled them at the beginning of the present century to hand over its keys to Russia.

Kasbek and Elbruz are volcanic excrescences, trachytic cones planted close beside the main range, and of much more recent origin.[1] M. E. Favre attributes their appearance to a period before the great Ice Age of the Caucasus, on the apparently conclusive evidence of the erratic boulders found on the steppe. Elbruz has the regular outlines of a typical volcano. Its characteristic peculiarity is that it culminates in two comparatively small cones of

[1] The distance of Elbruz from the watershed is reduced by the new survey from 11¼ miles to 7 miles. The position of the north-west peak relatively to the south-east is also shifted in the new map from N. 41° W., to N. 76° W. The heights of the peaks (given in Russian sajens, equal to 7 feet), are reduced from 18,526 and 18,453 feet to 18,470 and 18,347 feet respectively.

nearly equal height, separated by a gap some 1500 feet in depth, and 17,000 feet above the sea-level. Each of these cones preserves the features of a crater in a horseshoe ridge broken down on one side, and enclosing a shallow snow-filled basin. Observers from a distance, including M. Favre, have erroneously conjectured the deep hollow between the peaks to be a gap in an immense terminal crater, a supposition which the ascents by Mr. Grove and myself have now finally disposed of.[1]

Kasbek has a far less regular outline than its great rival, and the passing traveller who only sees it from the high-road may be excused for not recognising its volcanic origin. From the south its outline, if compared with the figures (on p. 123) in Judd's *Volcanoes*, has something of the aspect of a breached cone. Signor Lerco, a Piedmontese gentleman, who climbed the mountain in 1887,[2] has sent me a photograph taken on the top of the buttress conspicuous from the post-station (about 14,500 feet), which shows the crags that there protrude to be contorted masses of lava.[3] A great *névé* now clothes the northern face of the peak. Were a hut built on the ridge between the Devdorak and Chach glaciers, the mountain would be less dangerous than Mont Blanc, and not more difficult of ascent. It was by this route that we descended in 1868.

Generalities such as these, first gleaned from maps and books and scattered observations, the mountaineer summarises and fixes in his memory in the vivid moments spent on the mountain tops. De Saussure and Tyndall have both asserted the value of such bird's-eye views as a basis for scientific reasoning. I do not pretend to speak with authority on such high matters. Yet possibly an observer may not bring down less knowledge from these Pisgah-heights because he goes up to them without either a theory to support or a reputation to endanger. Of this much I am certain, that even to men not 'physically minded,' panoramas

[1] Grove's *Frosty Caucasus*, 1875.

[2] See *Schweizer Alpenzeitung*, Nos. 17-21. Zürich, 1888.

[3] M. E. Favre has reported as follows on a piece of rock brought from the top and submitted to him by my guide, François Dévouassoud : 'It is a grey rock of a semi-vitrified substance, containing white crystals of oligoclase.'

may be most useful in correcting some of the misapprehensions caused by the conventions of imperfect or uncontoured maps. I shall make bold, therefore, to call upon my readers to climb with me to a height of some 15,000 to 18,000 feet above the sea-level, and while resting on one of the highest crests of the Caucasus, to examine at leisure such a prospect as I saw unrolled before my eyes twenty-eight years ago from Kasbek and Elbruz, and on my subsequent journeys from Tetnuld, Ukiu, and the Laila.

DYKHTAU FROM THE WEST

The heaven overhead is of a deep gentian blue; the neighbouring snows are dazzlingly white; as the range recedes the peaks shine golden, until on the horizon the farthest crests and the thin streaks of cloud take a rich amber tint, shading off into faint sunrise pinks. A luminous, opalescent, transparent haze spreads over the lowlands, softening but hardly obscuring their features. About our solitary pinnacle all is still and silent, save for the lapping of the little waves of warm air that rise up to us from the valleys, the far-off and

indistinct, but perpetual murmur of falling torrents, and the momentary roar of avalanches as they plunge from the frozen cliffs of *névé* underfoot into the hidden depths of the glaciers. The vast blue landscape, some 500 miles in diameter, outspread beneath, is spanned by a broad belt of snowy heights and hollows, as the sky is arched at night by the Milky Way. These heights do not show as the single wall indicated on maps, but rather as a system of short crests, running generally at an acute angle to the direction of the chain, and more nearly due east and west. We can distinguish generally two (sometimes more) principal ridges roughly parallel. The peaks are encased in frosty armour, full of subtle lines and delicate flutings, where the corniced crests throw their bands of shadow on to the broad breastplate of snow. Below the *Bergschrund*, or fissure that belts the mountain sides, heavy folds of stainless *névé* fall to the lower glaciers. Where the crags are bare they show the boldness and rigidity of outline characteristic of the harder crystalline rocks. In the Central Group, round Shkara, Koshtantau, and Dykhtau, the forces, whatever they were, that gave the chain its being, seem to have been most strenuously exerted; the crests are higher, the slopes steeper, the trenches more profound. There is a vigour, an extravagance, one might say, in the mountain structure that may recall the Alps of Dauphiné.[1]

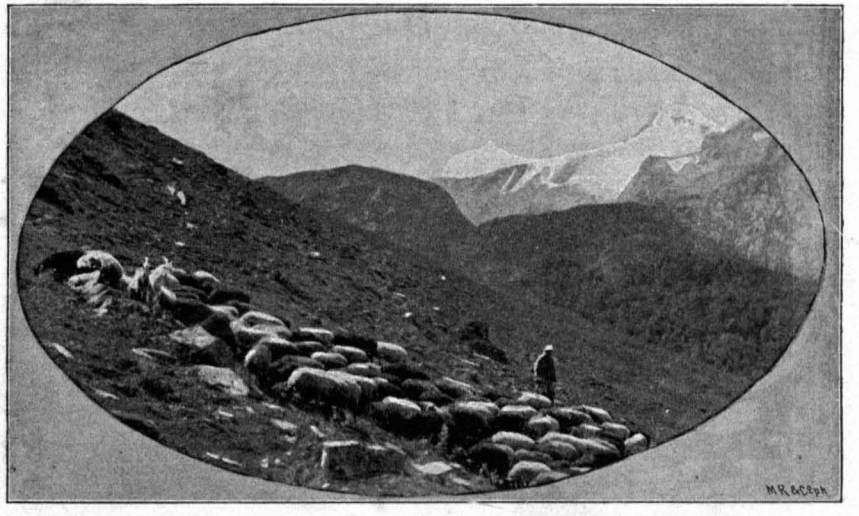
The hollows between the heights are filled by enormous firths of ice, whose basins stretch out parallel to the crests, snowfield beyond snowfield, on a scale hardly found in the Alps except at the bases of the Jungfrau and the Finsteraarhorn.[2] From the 'dusky doors' of the glaciers rivers flash, full-grown, into life, and our eyes follow their course in either direction, north or south, as they linger for a time in broad forest basins or grassy trenches at the foot of the snows, and gather their tributaries before battling a way out through deep ravines and a maze of foothills to the distant steppe or the dim surface of the Black Sea. What is the character of the country

[1] The Bezingi Glacier is a geological museum of fragments of crystalline rocks fallen from the neighbouring ranges, as curious to the eyes as obnoxious to the soles of those who tramp up this magnificent ice-stream.

[2] The Aletsch Glacier is longer than any glacier in the Caucasus. But the Bezingi and Karagom are little inferior to any other glacier in the Alps.

they flow through? Let us examine it more in detail, and first on the north. Here at the base of the central core of the chain spread broad, smooth, grassy downs, the pastures of the Turk and the Ossete. Downs I call them, for the name seems best to suit their rolling outlines, but their ridges attain 9000 to 10,000 feet. They are composed of friable crystalline schists, and atmospheric action has long ago destroyed the peaks that may once have crowned them.

Beyond these schists rises a broken wall of limestone, cleft to the base by gorges, through which flow the mountain torrents,



SHEPHERD AND FLOCK, NEAR KARAUL

and capped by pale precipitous battlements, which face the central chain at a height of 11,000 to 12,000 feet.[1] Beyond, again, lies a broad furrow, or 'longitudinal fold,' as geologists call it, parallel to the ridges, and then rises the last elevation, a belt of low calcareous hills, on which, here and there among the waves of beech-forest, purple or blue with distance, a white cliff retains its local colour, and shines like a patch of fresh snow. Beyond, once more beyond,

[1] Those who know Savoy may recognise an arrangement of rocks similar, though on a larger scale, to that found round Mont Blanc, in the granitoid rock of the Aiguilles, the schistose downs of Mégève, and the limestone cliffs of the Aiguille de Varens and Pointe Percée overshadowing the ravine of the Arve.

spreads the Scythian Steppe; not the dead level of Lombardy, but an expanse of long low undulations, which would be reckoned hills in our Home Counties, seamed by long shining ribbons which mark the courses of the tributaries of the Terek. On the horizon rise boldly—resembling in scale and outline the Euganean Hills—the Five Mountains of Piatigorsk. Farther east, the basin of Vladikavkaz is enclosed by a semicircle of low sandstone hills. They deserve closer inspection, for they might be found to be rich in traces of ancient glacial action.

Now let us turn our faces southwards. Here, too, immediately under the snows, we find 'crystalline schists,' smooth grassy heights separated by shallow trenches, which form the lesser undulations of the three basins, the 'Drei Langenhochthäler Imeritiens' of Dr. Radde. These basins, or 'longitudinal folds,' are enclosed on the south by the long high ridge of dark slates, which extends parallel to the crystalline chain from the neighbourhood of Sukhum Kale to the Krestovaya Gora. Behind this slate crest spreads a confused multitude of hills, jurassic and cretaceous in their formation, the geological features of which are outlined in the accompanying map. Their outer edge, distant some thirty to forty miles from the snows, is marked by a limestone belt, lower and less continuous than that on the north, which frames the gorges of the Rion and rises in the Kuamli (6352 feet) and Nakarala (4774 feet), near Kutais, to its best-known elevations. At the foot of the latter lie the coal-mines of Khibuli, recently connected with Kutais by a railway. Over its high uplands spreads one of the noblest beech-forests in the world, varied by a natural undergrowth of azaleas, laurels, box, and rhododendrons. Further west, on either side of the gorge of the Ingur, this ridge rises to a loftier elevation, and carries small glaciers, on heights designated on the five-verst map as Khodjall (9906 feet) and Larakhanis-chabi.

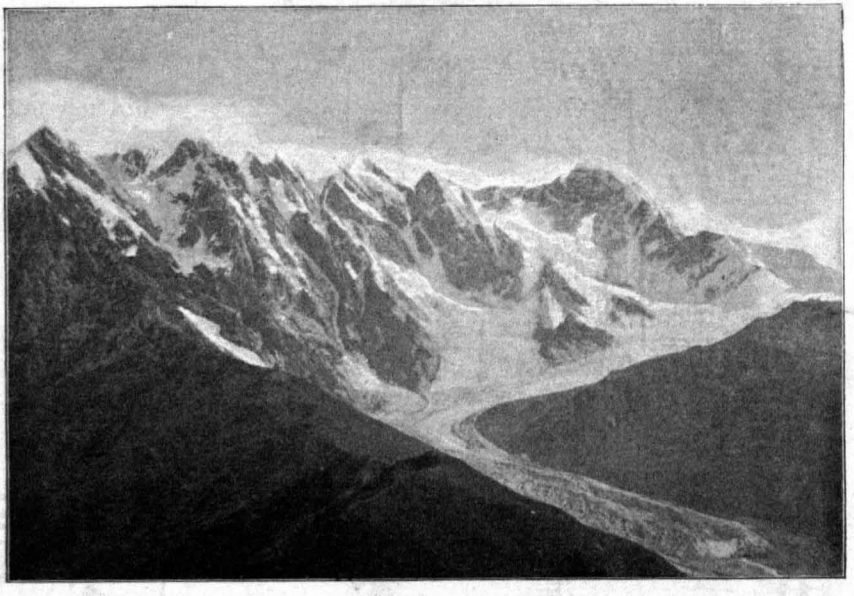
What ideas or suggestions may we derive from such a landscape? To me, great panoramas—Caucasian or Alpine—confirm the modern belief that the agency that first created mountain ranges was crumpling by pressure. That the original irregularity of surface so produced took the form of one enormous smooth-sided bank or

mound appears incredible. In the mountain structure we recognise a series of primary parallel ridges and furrows, enormously modified, possibly by subsequent exertions of forces similar to that which raised the chain, certainly by subaerial denudation in its various forms, but still roughly recognisable. How are we to account for the great clefts that split the crystalline rocks of the central chain to their base in the Upper Cherek, the Darial and Alagir gorges? We seem to require the exertion of some strain acting at right angles to the pressure which raised the chain. The shrinkage of the Earth's crust, to which the elevation of mountain regions is now generally attributed by geologists, might naturally cause such a strain. An alternative theory—held by too high authorities for me to venture to discard it—is that these gorges have been sawn asunder by water following its old channels through a slowly rising ridge of later elevation.

In either case internal forces have produced the rough-hewn blocks. But other agencies have been at work to model the noble forms we see around us: heat and cold, rain and torrent have, century after century, split the mountain crests and furrowed their flanks. Ice moving backwards and forwards along the hollows has polished and smoothed their sides, leaving behind it as it retired immense loads of the broken stuff it had carried down from the higher ranges. Water has followed, scouring the mountain slopes, tapping the hollows, or filling them up with alluvial matter.[1] These agents have done an enormous work, but they have been sculptors and polishers and carriers, not quarriers, and their share of work, even as sculptors, has been perhaps exaggerated. Like Michael Angelo in his colossal statue of David, they have had to follow the form of their material.

[1] The conservative action of ice could hardly be better shown than by the contrast between the upper sources of the Ingur and the Skenis Skali, which are closely adjacent. The former occupy shallow U-shaped troughs, the latter trenches 1000 to 2000 deeper, and V-shaped. The reason is obvious, at least to those who accept an axiom of Professor Heim which I have elsewhere (*Proceedings of the Royal Geographical Society*, New Series, vol. x. 1888) pressed on the attention of geologists. 'Glaciation,' Heim lays down, 'is equivalent to the relative cessation of valley formation.' At the Ingur sources the glaciers, owing to the configuration of the chain, always more extensive than those of the Skenis Skali, must have for centuries protected the slopes from the atmospheric action to which the hills of the Skenis Skali were exposed.

Weather and water are sharp tools; ice is Nature's substitute for sandpaper, and a fairly efficient one. But to attribute to it a chief share in the details of the present surface conformation of mountain ranges is surely excessive. On the glaciers an observer might, I fancy, obtain some hints as to mountain structure from what he sees in the ice of the behaviour of an imperfectly elastic body under strain, pressure, and exposure. The surface of the ice and its water channels are finally modelled by exposure to air and water action, but the broader elevations and depressions are the results of other agencies.



THE KALDE GLACIER

Let us now for a moment spread out on the crags before us the old five-verst map, and compare its presentment with Nature herself. So far as physical features are concerned, the most remarkable merit of the map lies in the accurate distinction made between the bare and forested districts. Its most patent inaccuracy is the great reduction of the area occupied by snow and ice.

I had occasion in the last chapter to point out how much mischief had been wrought through the acceptance by geographers of the

five-verst map as a complete physical survey. In no respect have the defects of this map been more prejudicial to the formation among those who instruct the public of a correct conception of the Caucasus than in the matter of its glaciation. The map-makers treated this physical feature with curious carelessness, not to say contempt. It may have been difficult for them to delineate or define, with any approach to accuracy, the limits and extent of the glacier region in the great chain. But there was no reason why, while practically ignoring the central snow and ice, they should have planted imaginary snows of considerable extent on some of the lower parallel ranges—for example, those south of the Rion sources.

It is only lately that the completion of many sheets of the one-verst map has enabled those who have had access to them to realise how unfounded were the statements current in scientific circles, and how fully justified we mountain explorers were in our contradiction of them.

It is now possible to furnish authentic figures as to the total area and length of some of the greatest Caucasian glaciers. The following have been computed for me very carefully by Mr. Reeves, the Assistant Map Curator of the Royal Geographical Society, from the new sheets, forwarded to me by the courtesy of the late General Shdanov and his successor. The measurements of length are taken along the centre of the ice-stream from the highest point of its *névé* down to its tongue.

	AREA.	LENGTH.
Bezingi Glacier	30·8 square miles.	10·6 miles.
Karagom Glacier	14·0	10·0
Leksur Glacier	19·2	7·6
Dykhsu Glacier	25·6	7·3
Zanner Glacier	21·3	6·6
Tuiber Glacier	21·4	6·6
Irik Glacier	8·7	6·6
Shikildi Glacier [1]	10·5	6·0

By way of comparison, I supply the measurements of eight

[1] In the statement of area I have tested Professor Heim's figures and find they are calculated on the same principle as Mr. Reeves's. The smaller rocks islanded in the ice, and forming part of a glacier basin, are included in the calculation.

Alpine glaciers, extracted from the publications of the Federal Staff and Professor Heim's work :—

	AREA.	LENGTH.
Aletsch Glacier . . .	49·8 square miles.	15·5 miles.
Unteraar Glacier . . .	15·1	10·0 "
Mer de Glace	16·0	9·5 "
Gorner Glacier	26·6	9·0
Viescher Glacier . . .	16·0	9·0
Corbassière Glacier . . .	9·4	7·0
Morteratsch Glacier . . .	9·3	6·0
Zmutt Glacier	10·4	6·0

It will be seen that, putting aside the Aletsch Glacier, which owes its abnormal size to the combination of a large basin and a long high-level trough—large glaciers do not make deep troughs, but shallow troughs make large glaciers—the great Caucasian ice-streams are about equal in dimensions to those of the Pennine and Bernese Alps.

The foregoing statistics give, however, but an imperfect idea of the extent and grandeur of the ice-region in the Caucasus. On the north side there is a fine glacier at the head of every valley between the source of the Kuban and that of the Ardon. There are often several separate glaciers of the first class—as we reckon them in the Alps—in a single valley, as in the Bashilsu or in the Adyrsu. If I remember rightly, some writer has reckoned all the ice in the latter valley as a single glacier, and thus been led to class it as among the most extensive of the Caucasus. This is true in a sense, but the mode of classification is not one accepted in the Alps, and may lead to confusion.

Turning to the lesser chains, the glaciers of the Laila are perhaps as extensive as those of the Grand Paradis. The range north of the Urukh valley is very rich in glaciers (the total area of snow and ice is not less than 31 square miles), and the snowfields about Kasbek and Gimarai Khokh are of vast extent (total area, 53 square miles).

The lower ends or snouts of the Caucasian glaciers are naturally, in consequence of the latitude, higher than the Swiss. The

Karagom Glacier, 5700 feet, reaches the lowest point on the northern side; on the southern side the Chalaat and Leksur Glaciers united at about five thousand feet not many years ago, and end now two to four hundred feet higher respectively. The point to which the glaciers descend would appear to be regulated much more by the size of their *névés* and the conformation of their beds than by their exposure: for instance, the Zanner and

THE SOURCE OF THE INGUR

Bezingi Glaciers, on opposite sides of the chain, both terminate between 6800 and 7000 feet.

The suggestion that there are no more than 46 square miles of ice in the Caucasus may now be finally dismissed. It is too soon to say exactly what extent of ground in the whole chain is under ice. Let us avoid the snare of our predecessors, hasty generalisation, founded on imperfect material. Until the range as a whole has been scientifically mapped, no final and accurate estimate can be possible. But for the Central Caucasus alone,

an estimate of from 625 to 650 square miles will not be very far wrong. This is not a guess, but the result of very careful calculation with the best available material.[1]

From the glaciers we naturally raise our eyes to the crests that overshadow them. The ridges of the Central Caucasus are far steeper than those of the Central Alps. The whole southern front of the Central Group keeps up the average slope of the steepest part of the eastern face of Monte Rosa; it is as if the Macugnaga precipices extended for ten miles. The northern front is almost as steep, though less lofty. Take the steepest bit of the Breithorn, double its height, and spread it along from Monte Rosa to the St. Théodule, and you may form some faint picture of what the mountaineer sees from the heights above the Bezingi Glacier. He fancies nature has here done her utmost in the perpendicular style of mountain architecture. Then he goes up the neighbouring Mishirgi Glacier—quite left out in the five-verst map—and sees precipices profounder and still more impressive.

Sheer rocks are often strange rather than beautiful objects. The frozen combes of the Caucasus owe their singular fascination to the ample folds and exquisite arrangement of the snowy drapery that clothes their crags. In a run I made to the Bernese Oberland, soon after my return from one of my Caucasian journeys, the first thing that struck me was the comparative meagreness of the *névés* and glaciers clinging to the loftier summits. A great deal of the Caucasus is like the finest portions of the Alps—the Wengern Alp face of the Jungfrau, or the Pelvoux above the Glacier Noir. Signor Sella's and M. de Déchy's photographs of the Bezingi and Mishirgi Glaciers illustrate this splendid feature in their scenery.

The first feature to attract attention, as we descend from the mountain crests towards the south, is the exquisite verdure of the highest uncovered slopes. Every isolated piece of bare soil among the Caucasian snowfields becomes a summer garden. The moraines

[1] The glaciers of Switzerland cover 710 square miles. No one, so far as I know, has yet been at the pains to compute accurately the amount of ice in the whole Alps or even on both sides of the Pennine Chain. In the Mont Blanc group the ice covers about 100 square miles.

get covered over very quickly with grass and flowers, which makes them 'look pleasanter'—to borrow the phrase of an Irish peasant discovered covering over with moss the stumps of his landlord's trees, which he had illegally cut down. It is also useful to the student of glacial oscillations; for directly the ice begins to advance, its motion is shown by the barrowfuls of unmistakably raw rubbish it shoots over the grassy banks. Near the foot of the Leksur Glacier I noticed a little island of vegetation on some rocks covering the centre of the ice. It is possible, however, that this may have been not an ordinary moraine, but soil brought down by an avalanche.

I have gathered flowering plants at a height of over 13,000 feet on Ukiu. At this height the stalk and leaves are tiny, the blossoms abundant and vivid in hue. Dr. Radde has described how he found flowers at about the same height on Elbruz.[1] Thereupon a local 'scientist' took occasion to point out the incredible character of his statement. From the critic's point of view, it was an *a priori* impossibility for flowers to blossom above the snow-level. In the Alps I have found *Ranunculus glacialis* in blossom on the final peaks of the Cima di Castello and the Adamello, at over 11,000 feet, and gentians and forget-me-nots, dwarfed to tiny specks of exquisite brightness, on the southern ridge of the Basodino (10,500 feet). Probably flowering plants will be found in the Caucasus at higher elevations than any that have yet been noted. The slopes above the great Leksur Glacier, from 9000 to 10,000 feet, were green in July, and the grass was enlivened with poppies, *Anemone narcissiflora*, gentians, ranunculus, campanulas, myosotis, veronicas, geraniums, framed by the darker foliage and great cream-coloured blossoms of the *Rhododendron caucasicum*.

The general type of the vegetation is more luxuriant than on the Alps. The giant Caucasian snowdrop, which we grow in our gardens, is typical of the Caucasus. The species are larger, the blossoms more abundant, and near the snow perhaps somewhat less brilliant in colouring; whites and yellows—the colours in

[1] *Die drei Langenhochthäler Imeritiens.* Tiflis, 1867. My little specimens were unluckily lost out of a pocket-book; one was, I believe, a pyrethrum.

which lowland nature welcomes the spring—are often prevalent. There are few cryptogamic plants (as far as I have observed), few of those lovely little stunted lichens and mosses which enamel the rocks of the high Alps. No edelweiss (*Gnaphalium leontopodium*) has yet been met with in the Caucasus proper, but I understand from Dr. Radde that he has found the Alpine species in the Armenian ranges near Kars. Of gentians there are many varieties, but the species are not identical with the Alpine. Generally the flora has singularly little in common with that of the Alps. A German botanist states that the Alps and Himalaya have more species in common than the Alps and Caucasus. There is no very marked general distinction between the character of the flora on the two sides of the chain—at least in the uppermost region. The broad Armenian highlands serve far more efficiently as a botanical barrier than the lofty but comparatively narrow line of Caucasian snows. But the vegetation of the forest zone is much more luxuriant on the Asiatic than on the European side.

Mountaineers are generally too late to see the flora in perfection. After July it is only close to the snow-line, in northward-fronting dells, or where a late-melting avalanche has artificially retarded the spring, that blossoms are found at their best. Botanists at this season must look out for a green speck just freed from an avalanche, in order to discover the early mountain blooms. In August 1887, primulas, which abound, were nearly over. A beautiful golden crocus we found only on the Goribolo. Tall yellow lilies were common: of wild roses I noticed several varieties; a white rose, delicately flushed with pink, was the commonest. Strawberries, raspberries, and currants abound on the south side, particularly in the glen of the Skenis Skali. Plums and pears almost drop into the mouth of the traveller as he rides down the valley of the Kodor, and this basin, and still more that of the Skenis Skali, is a very Brobdingnag of the vegetable world.

From the high pastures of the wild-goats, from secret lawns no scythe has ever touched, no flock ever grazed, where year after year the snows of winter are succeeded by the snowy

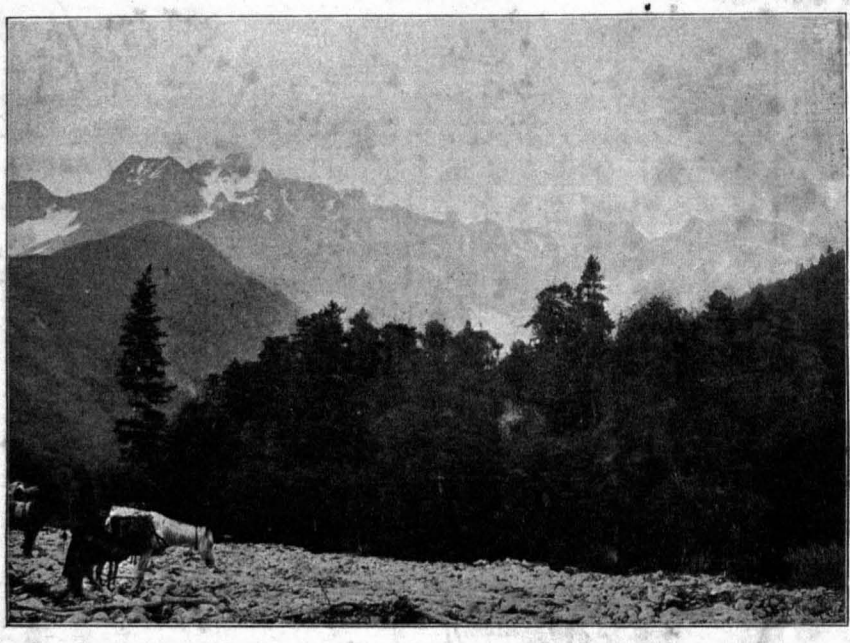
blossoms of the mountain rhododendron, we descend to the forests, the upper limit of which may be put at from 7200 to 8000 feet. The Caucasian woodlands present the vegetation of Central Europe in its greatest perfection and variety, together with an undergrowth of flowers unique in its richness and profusion.

In a recently published volume, M. Levier, a Swiss botanist, has depicted the forests of the Southern Caucasus with the enthusiasm of an artist joined to the precision of a specialist. His descriptions will naturally carry more weight than any words of mine, and I gladly avail myself of his kind permission to transfer to my pages his account of the first excursion he made among the hills of the upper Skenis Skali. The ridge the travellers ascended lies to the south of Cholur (3400 feet), in the Skenis Skali valley, some twenty-four miles below the sources of that river.

'Immediately above the cultivated fields is the zone of the underwood—rhododendrons, sweetbriar, hazels, crab apples, thorns, mountain ashes; this region and the environs of the village are covered with tufts of a groundsel, with blossoms of rosy white. Soon the true forest is reached, a forest of lofty deciduous trees, where willows, hornbeams, aspens and oaks are interlaced with enormous beeches, festooned with the white beards of the *Usnea*. The birch appears, diminishing in size as one ascends until it becomes little more than a bush. Nordmann's pines are met at first as isolated trees, then, gathering in imposing clusters and groves, they form the predominant element in the forest, where the underwood never entirely disappears.'

Some 3000 feet above Cholur, the travellers issued on a glade of a fairy-like aspect. 'It was a garden, but a garden of the gods. In a vast clearing, an amphitheatre of which the walls were rocks and pines, myriads of monkshoods, surpassing the height of a man on horseback, displayed their blue and white flowers. Raised one above the other and artistically grouped as if by the hand of a skilful landscape gardener, they adorned a long hillside. A crowd of other plants of the most diverse kinds disputed the soil with them, pushing between the straight stalks of their rivals, and

prolonging their own blossoms as far as possible towards the light. It seemed a struggle as to which should climb above the heads of its neighbours and exhibit the most brilliant colours. The firework of flowers recalled the artificial bouquets of coloured stars thrown up against the sky at some city festival. A dense mass of verdure, composed principally of the great leaves of a groundsel and of the Alpine sorrel, covered another part of the



THE SKENIS SKALI FOREST

glade, penetrating under the pines, and completely hiding the path. The enormous panicles of an ashy-blue campanula rose out of this confusion, and loftier still, the rival of the monkshoods, a scabious, balanced its great yellow flowers some six to eight feet above the ground.

'A little further there was a display of white umbelliferous blossoms, fine grasses, potentillas with blue-green leaves. In the places where the flowers reached only to our knees we picked handfuls of azure columbines with white centres, ranunculus of

several species, an *Astrantia* with pink stars, delicately veined in emerald green, a flower which seemed expressly made to decorate ornamental notepaper or a Valentine. There was also a species of our Alpine snake-weed, with loose spikes and petals of such a vivid crimson that even our servant set to work to gather them for us, and was quite chagrined to see that we neglected them.

'On pushing apart the high stems we discovered another layer of flowers less eager for light: forget-me-nots, herb-Paris, orchids, geraniums, etc. Close to the ground the soil was covered by a carpet of little round leaves supported by thin stalks like those of the maidenhair fern; these were the leaves of a shade-loving speedwell (*Veronica liliformis*, G. M.), which, like our violet, blooms modestly beneath great green sunshades.

'I was debating how to pack my immense nosegay when my companion called me from above. I clambered in his tracks, and found him dripping with dew and digging frantically among plants higher than his head. It was real pioneer work to clear a path through this antediluvian vegetation, wherein we were like lost Lilliputians. The high rocky walls, still in the shade, were superb. Here reigned saxifrages, rock-valerians, enchanter's night-shade, groundsels, ferns, and succulent mosses as full of water as sponges. In the air also—for we had to look everywhere—were the winged fruits of maples, which formed the underwood, looking like bouquets of flowers, so vividly did their madder colour stand out under the green cupola of pines. After the first exclamations we collected our spoils in silent haste, oblivious of time, forgetful of the road we still had to travel. We had to come down at last and sort our treasures, and press those that could be pressed.

'Our men were in no hurry. They were well content with this short halt, seasoned with a pipe under the pines. The horses grazed at their will, and seemed as pleased as we were to come across such an El Dorado of tender herbs. They trampled the sorrel and made wide openings among the monkshoods, massacring indiscriminately both common and rare species, while we sat astride a rotten trunk rapidly putting our specimens in paper. Pressed by the advancing hour, we ended by leaving a heap of

flowers, enough to have sufficed for three weddings, on the ground, and remounted our horses.

'The path became better, and we could at least botanise with our eyes without having constantly to war with the branches. But the flesh is weak. Before we had gone two hundred paces we had once more jumped to the ground, magnetically attracted by new marvels. The first was a giant campanula, as deeply blue as a gentian, a Caucasian exaggeration of our European *latifolia*; then a gentian with lilac petals stippled with black;[1] next an Inula, justly named *grandiflora*, recalling the elecampane, a Pyrethrum with white umbels[2] growing higher than a man; and, lastly, once more the beautiful yellow lily already gathered in Ajaria, a bulb of which we took away. These bulbs, it may be remarked, are beginning to be exported, and fetch a good price; and we were told that some European collectors had them pulled up by the hundredweight and sent them to England. They will not succeed, however, in destroying the species very soon, for it is widely distributed throughout the Caucasus, and is found up to the highest meadows, of which it is one of the most beautiful adornments.

'"Forward, signori!" Gosta has just shot an edible bird—a thrush, I think—and he grows impatient. Our little band marches on once more, those on foot in single file, the horsemen behind, determined at last to make up for lost time and to resist the enchantments of the *macroflora*. This is the name we henceforth apply to this vegetation of giant plants, which is not mentioned in treatises on geographical botany, and of which we have read only in certain passages in Dr. Radde's works.[3] *Macroflora* is a hybrid neologism, which might not be tolerated on the plains, but under the domes of the great pines, at 6000 feet above the sea, it may perhaps pass muster.

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[1] *Sweertia punctata*, Baumg. *Pyrethrum macrophyllum*, W. K.

[3] *Vier Vorträge über dem Kaukasus*, *Petermann's Mitt.*, Ergänzungsheft 36; *Die drei Langenhochthäler Imeritiens*, Tiflis, 1867. E. Levier, *A Travers le Caucase*. Paris, Fischbacher, 1895. I dwelt on this characteristic of the Caucasian flora in my *Travels in the Caucasus*, published in 1869, and again in my paper published in 1888 in the *Proceedings of the Royal Geographical Society* (November), where I first wrote the words repeated on p. 43: 'The general type of the vegetation is more luxuriant than on the Alps. The species are larger the blossoms more abundant.'

'As we rode we exchanged opinions and outlined a theory. From the first, one fact had impressed us. A certain number of species, which we had already seen elsewhere, attained much greater dimensions in the glade of monkshoods than at lower levels, where they grew more or less singly. Other species, and those the largest of all, growing in imposing masses, were absent at lower levels, but they ascended with us after 6000 feet. These probably were the fixed and normal species of the *macroflora*, and the others only adventitious ones, which had found the ground occupied by competitors six to ten feet high, so that, except by inordinately lengthening themselves, they would be in danger of finding neither space nor light. The struggle for existence had made them macro-campanulæ, macro-potentillæ, etc., giants for the nonce. This tendency can also be observed at home on a small scale. Slender and drawn-out plants, such as the cow thistle, the scarlet poppy, the phalaris and other weeds which grow among the brushwood of our forests or between the spikes of grain, often reach a height of five to six feet. But in Europe such occasional giants are thin, with stems of no solidity, whereas here it is quite different. For instance, it is possible to pull up a *Campanula lactiflora* six feet high (this species being only from one and a half to two and a quarter feet in the valley), and yet the stem does not bend in the hand when it is taken out of the ground. The leaf-stalks themselves are often remarkably vigorous; thus the great kidney-shaped leaves of a valerian[1] are borne by very long petioles, which are strong enough to allow them to be used as sunshades, like those of the petasites in Europe.

'Such luxuriance of spontaneous vegetation could not exist without one fundamental condition, that of a fertile soil impregnated with stores of natural manure almost inexhaustible, and this is admirably realised in the rich mould of the Caucasian forest. Beneath the living forest lies a dead forest—not one dead forest, rather the dead forests of several thousand years. On passing through the woods we see and sink into the crumbling rotting

[1] *Valeriana alliariæfolia*, Vahl.

trunks which fall everywhere, and slowly get buried after having yielded life to innumerable epiphytes, large and small, ferns, mosses, lichens and fungi. Something quite analogous to this burying of dead trees in the forest goes on in the mountain meadows, where the masses of giant plants, left to themselves and seldom trampled by herds, droop in the fall of the year and give back to the ground the elements of their future renewal.

'No matter how rich a soil may be, however, it can never lengthen the stem of a cornflower, a poppy, or a tulip, beyond a certain limit. Something more is needed to explain the extraordinary height of these monkshoods, cephalaria, mulgedia, and groundsels of the Caucasus, among which men on horseback might play at hide and seek without stooping, as among the cardoons (*Cynara cardunculus*) of La Plata. These gigantic dimensions date neither from yesterday nor from a thousand years ago, but are a legacy, an inheritance, of still earlier times. We are really dealing with survivals of the giant flora of past ages, of which a certain number of characteristic species have been preserved, owing to specially favourable conditions of soil and climate. These ancients of the Earth—if the expression may be permitted—are the true indigenes, and determine the character of the accidental intruders who have come amongst them. It would make a most attractive subject for research to determine exactly the number of these veterans and their mode of association, to study them from one end of the chain to the other, and to distinguish what are the essential and what the accidental elements of the *macroflora*.'

The great screen of forests, spread along the outer northern flank of the chain, has been less frequently described. The steppe, except in the sunk river-beds or round the villages, is treeless; but no sooner does the ground begin to rise than wild fruit-trees appear, soon to be succeeded by dense groves of beeches. Azalea and rhododendron—the common lilac variety (*ponticum*)—flourish under their shade. The glades are bright in summer with millions of golden flowers, probably the *Telekia speciosa*, which the ordinary traveller may easily mistake, as I did at

first, for wild sunflowers. In old days these woods were debatable ground, and they long served as one of the chief protections of the mountain tribes. The Turkish tribes on the Cherek and Chegem and Baksan held the fastnesses in their rear. North of them, on the edge of the plain, lay the Cossack *stanitzas*. On their skirts hung the bands of robbers, led by *Jighits* or braves. The word survives. I was myself once saluted as a *Jighit* on the crest of the Caucasus by some grateful Turks whom I had relieved of the labour of step-making in soft snow.

A characteristic saying of Schamyl's has been reported:—'Would that I could anoint the forests of the Caucasus with holy oil and pour libations of honey on its mud and mire, for these are the best protectors of its independence.' But even before Russian times the forests had served as a barrier. The Turks or Tartars who live behind them have little connection with the Kabardans of the outer hills. They were driven into the mountains by the latter. The Turkish highlanders are broad, big men: the chief of Bezingi stands 6 feet 3 inches at least: the Kabardan is of a different build, slighter and darker, keener-looking, but sometimes effeminate. The Urusbieh princes are of mixed blood, and arguments based on their appearance or manners might be misleading.

The forests extend to the upper end of the limestone gorges. Above them the crystalline schists are bare. Every beam the house-builders of Bezingi and Balkar use must be dragged a journey of several hours. The shepherd's fires are fed on the twigs and roots of the *Rhododendron caucasicum*, and in consequence the plant has in places become almost extinct.

To this barrenness of the upper northern glens, however, there are exceptions. The head-waters of the Baksan and the Urukh, the Bashil valley, and some of the side glens of the Ardon, possess fir and pine woods. Nothing is more striking in the Central Caucasus than the suddenness of the change from woodland to barren scenery. The natural causes in soil and climate of such changes are extremely obscure, and human agency and the ravages of herds further complicate the considerations that have to be

taken into account. I have noticed that the crystalline schists are generally bare, while the granites and limestones are clothed in forests. The slates of the southern chain are heavily wooded on the south side, but bare in the Ardon basin.

The deficiencies as well as the excellencies of the Caucasus must be noted. It possesses no remarkable waterfalls, no lakes, and few tarns — neither sub-mountainous lakes like Como, Garda, Geneva, Lucerne, nor clusters of tarns like those that dot certain crystalline districts of the Alps.[1] Waterfalls worth a special visit are not very common even in Switzerland. I would not attach to their absence more weight than it may reasonably bear. An inference might be drawn in favour of the Caucasus having been more waterwashed, of the torrents having had force and time to cut themselves a way out of their difficulties. Geologists may possibly find other reasons in the disposition or dip of the strata.

The absence of lakes is a more serious matter, and must be faced by those who believe that the great prehistoric glaciers excavated lake-basins. They will probably meet it in one of two ways: they may either assert that 'the Caucasus never had a glacial epoch,' or that 'its glaciers excavated basins which have been either tapped or silted up by subsequent water action.' The evidence will, no doubt, be made fuller, but already sufficient facts have been collected by Abich and Favre to show that the glaciers of the Caucasus at one time reached to the northern plains. Erratic blocks have been found near and beyond Vladikavkaz. We are entitled, therefore, to dismiss the first supposition. On the other hand, an existing basin may be emptied of liquid in two ways, either by tapping it or by filling it with solid. It is arguable that lake-basins may have existed in the Caucasus and been subsequently obliterated by either process. A recent traveller in the Sierra Nevada of North America, Mr. Muir, has described very clearly the process of lake-destruction by these methods he witnessed going on

[1] According to Dr. Richter (*In hach Regionen*: Berlin, 1895) there are no less than 2460 lakes or tarns in the Alps *east* of the Splugen.

under his eyes in ground from which glaciers had recently withdrawn.

I disbelieve, for reasons I have set out fully elsewhere,[1] in the excavation by moving ice of rock-basins. But that glaciers keep them scoured and leave them empty is obvious, I suppose, to every mountain traveller who uses his eyes. I cannot doubt that glaciers preserve basins formed by other agencies, and that when the protection of the ice is removed such basins are slowly drained or obliterated. The absence of water-filled hollows in the Caucasus is, in my belief, not conclusive, one way or the other, as to the glacial origin of mountain lakes. What it may prove is that the period during which the glaciers have not greatly exceeded their present dimensions has been a longer one in the Caucasus than in the Alps.

The movements of Caucasian and Alpine glaciers have of late years shown a general correspondence. In 1868 the Caucasian ice was in retreat. About 1875 the tide seemed to turn; and in 1887-89 many glaciers were slightly advancing.[2]

Great glaciers, heavily snow-draped peaks and ridges, rampant vegetation, all point to the conclusion that the Western Caucasus has a very moist climate. They point also to the fact that it has no long dry season. The part of the Alps which the general aspect of the flora most recalls—I am not speaking of the identity of species—is the Dolomites, or Venetian Alps. It rains or snows heavily in spring or winter in Corsica or the Maritime Alps; but there, above the zone of artificial irrigation, you find comparatively few flowers, and the reason is obvious—the long summer drought. Statistics bear out this conclusion; returns of meteorological observations from Stavropol, Vladikavkaz, and the Caucasian Baths north of the chain, from Batum, Kutais, Sukhum, Poti, Gori, Tiflis, to the south. Observations from Oni, or Betsho, or

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[1] *Proceedings of the Royal Geographical Society* (New Series), vol. x. p. 779, 'A Note on the Conservative Action of Glaciers.'

[2] M. de Déchy has, in his various journeys, taken a certain number of observations with the mercurial barometer of the heights of the ends of glaciers and of the line of *névé*, and also set marks and dates opposite the ends of the ice. See his paper in the *Proceedings* of the Geographical Congress at Paris in 1889. M. Jukoff has also published some measurements in the *Proceedings of the Royal Geographical Society*, vol. xiv. p. 112 (1892).

Balkar, in its heart, are still a desideratum. The rainfall map in Reclus will require correction by the light of the recent publications of the Russian Meteorological Office.[1]

The heaviest fall, sometimes over a hundred inches per annum, is where the sea-winds strike the first hills at Batum and Kutais. It is somewhat less at Sukhum, and diminishes also westwards towards Kertch. Generally, the tendency is to relative dryness as you go eastwards across the isthmus. At first sight it may seem a curious exception that the rainfall at Vladikavkaz (32 inches) should be far in excess of that of the Caucasian Baths (18 inches). This, however, is sufficiently explained by the fact that Elbruz, acting as a great condenser, draws to itself and precipitates clouds which pass more easily through the gap of the Mamison.

Generally, the climate of the Western Caucasus is much moister and less warm than that of the Western Pyrenees. The rainfall at Kutais is double that at Pau, and about equal to that at Tolmezzo, at the head of the Adriatic; the mean annual temperature is slightly less than at Pau. The climate of Tiflis is less dry, but somewhat hotter, than that of Madrid. The plains north of the chain, which are far colder in winter than the mountain valleys, suffer greater extremes of temperature than the Swiss lowlands. Summer comes in with a burst in May, but June or July are often among the wettest months. The humidity of the summer climate is a danger to the mountaineer, and at once a charm and a vexation to the traveller. When the west wind blows in fine weather, clouds and a shower come up every afternoon from the Black Sea. The explorer risks being befogged —no slight risk on the vast snowfields—and the snow on steep slopes is kept in a very hazardous condition.

Readers will expect to be given a figure for the snow-level. Natural philosophers have spoken disrespectfully of late of the sea-level. I have even heard an ex-President of the Geographical Society suggest that it may vary to an extent of 500 feet,[2] and

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[1] Wild, H., *Die Regen-Verhältnisse des Russischen Reiches*, and Appendix C.

[2] *Lectures on Geography*, by Lieutenant-General Strachey, R.E., C.S.I., P.R.G.S., p. 33.

I am told that this is a moderate estimate. I may be excused, therefore, if I tell the truth about that vague old abstraction, 'the snow-level.' The figure given for it in an extensive range may serve as a useful mean, but in most places must be locally inexact. For 'the Caucasus' it is impossible to lay down any limit which shall be even approximately accurate for the whole chain and both sides of it. The chain extends over five degrees of latitude; more than that, its rainfall is at least four times greater at the Black Sea end than it is at the Caspian end. Naturally, at one extremity snow lies permanently down to about 9000 feet, at the other ceases at about 12,000 feet. In the central part of the chain nothing like a continuous snow-bed, not due to avalanches, is found under 9500 feet, and on the northern spurs, where there is less fall, and black rock-slopes facing southwards are exposed to a sun which raises the steppe shade-temperature to over 90° F., the snow-limit will rise in places to over 11,000 feet. For the snow-level in the central chain 10,000 feet may be taken as a fair figure. But as I have said before, this limit should be represented by a zigzag line going up and down, according to accidents of exposure, soil, and vicinity to large glaciers. Let us get rid altogether of a statement frequently repeated, that Dr. Radde found the snow-level 8400 feet at the Rion sources. What he wrote was, that in September he found patches of *fresh-fallen* snow at that height. This is how error may be created by inaccurate copyists![1]

I have given elsewhere a catalogue of 'Peaks and Passes.' It may be enough to mention here a few of the most conspicuous.

Before 1870 the Russian surveyors had triangulated only a few of the snowy peaks—those which are most conspicuous from the northern steppe—Elbruz, 18,470 feet; Koshtantau, 16,880; Dykh-tau, 17,054; Adai Khokh, 15,244; Gimarai Khokh, 15,672; and Kasbek, 16,546. Between the Marukh Pass and the Mamison Pass the five-verst map does not give a single height on the watershed. It was left to the new and still unpublished survey to find figures for Dongusorun, 14,605; Ushba, north peak,

[1] The figures given are those of the new survey, which differ in many cases from those of the five-verst map.

15,400, south peak 15,409; Tiktengen, 15,127; Gestola, 15,932; Tetnuld, 15,918; Janga, 16,569; Shkara, 17,038; and a crowd of other peaks of between 15,000 and 13,000 feet. In a space some ten miles square in the Central Group there are found to be no less than twenty distinct summits of over 14,000 feet.

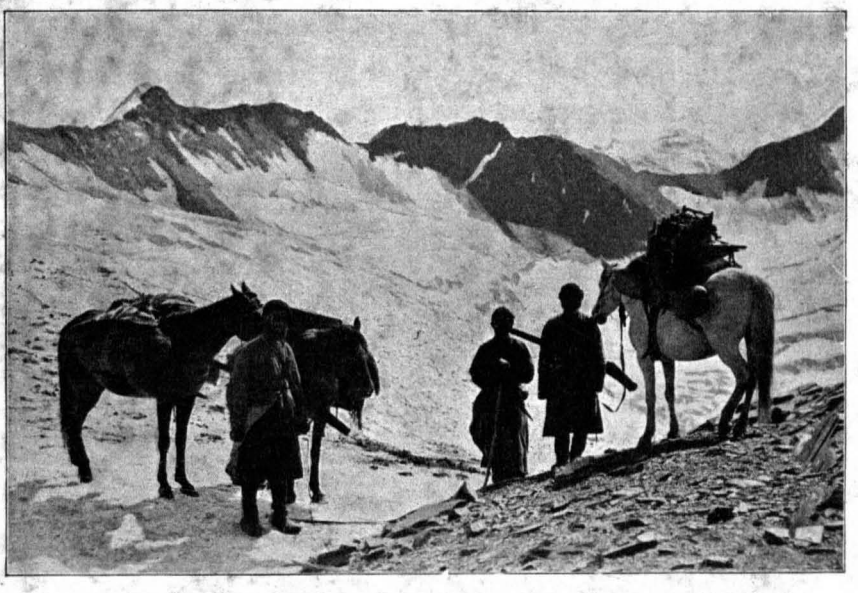
To orographers and map-makers the importance of Shkara long remained unrecognised. This noble mountain is the Monte Rosa of the Caucasus. Conspicuous from the southern plains and even from the seaboard, it culminates like its Alpine rival in a five-crested ridge. It has its Gorner Glacier in the Bezingi Glacier, and its Val Anzasca in the glen of the Zena.

I am responsible for the erroneous identification (in 1868) of Shkara with the Koshtantau of the five-verst map, now called Dykhtau. Twenty-seven years ago, when I drew the view from the Shtuluvsek, we saw two great mountains where only one was marked on the map. Here was a dilemma. Shkara from this point of view was far the more imposing, and we called it Koshtantau, while the peak that had been measured under that name on the map we called an 'unknown peak.' Consequently, students of Caucasian literature must be careful to remember that the Koshtantau, not only of my *Central Caucasus*, but also of Mr. Grove's book and Mr. Dent's early articles, is always Shkara.

In addition to Shkara we have found and climbed, and the surveyors have now measured, three more great peaks on the actual watershed, and one projecting slightly from it on the south towards Suanetia. These are the broad-faced Janga—an exaggerated Piz Palu; the saddle-shaped crest of Katuintau; the cone of Gestola; and the white pyramid of Tetnuld. All these mountains are between 15,900 and 17,100 feet in height—higher, that is, than Mont Blanc. On the other side of the trench—at their northern base—filled by the Bezingi and Dykhsu Glaciers, the Dykhtau-Koshtantau ridge rises in the form of a horseshoe, with at least five peaks of over 15,000 feet.

Next in prominence to the Central Group, on the main chain, are to the west the peak of Tiktengen, the Schreckhorn of the Caucasus, which dominates the head-waters of the Gara-auz; the

summits that cluster about the twin towers of Ushba, the Matterhorn of the Caucasus, which rise less than a mile south of the watershed to a height of 15,400 feet; and the broad mass of Dongusorun. Farther east, the chief glacier group on the watershed is best known from the name assigned, somewhat arbitrarily, to its highest point, as the Adai Khokh group. It consists of half a dozen or more summits, closely approaching 15,000 feet, which, like the mountains of the Oberland, gather



CROSSING THE CHAIN

round the *névés* of two great glaciers, the Karagom and Zea, both of which drain to the north side. East of the Mamison, all the more important peaks are in the range that continues the line of the watershed, though it has ceased to fulfil this function. Tepli, 14,510 feet, is separated from Gimarai Khokh and Kasbek by a practicable horse-pass, but may be conveniently treated as belonging to the same group.

The passes over the main chain of the Central Caucasus crossed by natives are numerous. West of the Mamison there are none but glacier passes, while from this point eastward horses can cross

the chain in many places. I do not propose to delay my readers with a catalogue. Some of the glacier-passes—like the St. Théodule and Col de Collon in the Middle Ages—are recognised routes for the passage of cattle and even occasionally, and under favourable circumstances, of beasts of burden; others are used only by hunters or refugees. The more frequented passes, counting from west to east, are the Jiper, 10,717 feet; the Dongusorun, 10,493; the Betsho Pass, 11,474; the Tuiber, 11,764; the Karaul Passes, 11,679 and 11,270; and the Gurdzivsek, 10,976. Between the Mamison and the Krestovaya Gora the Bakh-fandak Pass, 9569 feet, seems to be that in most general use. Professor Hahn states that the Roki Pass, 9814 feet, which lies slightly more to the east, has been selected and surveyed as the future route of the long-projected Caucasian Railway. Both these passes lead from the basin of the Liakhva into that of the Ardon.