

- (3.) The possibility that the Amuri limestone may bridge the gap between Cretaceous and Miocene.
- (4.) The elevation of a foraminiferal limestone and its subsequent erosion followed by depression and deposition of glauconitic limestone (or sandstone) without any intervening strata would necessitate extraordinary conditions.

Professor Park has already pointed out that an unconformable contact similar to that between the Amuri limestone and the Weka Pass stone exists between the Cretaceous and Eocene in the south of England (17, p. 413). The writer may draw attention to unconformable contacts between Palæozoic limestones in the United States that present even closer resemblances. According to E. O. Ulrich, "many unquestionable unconformities between two limestones have been satisfactorily located" (20, p. 463). Ulrich mentions specifically several instances of limestone succeeded unconformably by parallel-bedded shale, which he says is a rarer phenomenon than that of unconformity between two limestones (20, p. 463). Portions of a detailed description of the unconformity at the base of the Onondaga limestone in New York by Edward M. Kindle (27), with verbal alterations, could be applied to the contact of the Amuri limestone with the overlying beds.

It is clear that admitted cases of unconformity between two parallel bedded formations are not uncommon, and therefore that most of the reasons hitherto advanced for favouring conformity lose much of their force. On the other hand, although some degree of discordance is clearly present, further evidence is required before this can be regarded as proved to extend over the whole interval between Cretaceous and Miocene. Such evidence, if it exists, is most likely to be furnished by the detailed geological mapping of the whole district surrounding Weka Pass. It is possible that the supposed unconformity is in reality between Eocene and Miocene, and not between Cretaceous and Tertiary. This, however, is at present a conjecture, based upon the stratigraphy of the west coast of the South Island, where the marine Cretaceous is probably wholly unrepresented.

ANALYSES OF LIMESTONES, ETC.

	(1.)	(2.)	(3.)
Silica (SiO_2)	11.12	7.52	6.74
Alumina and ferric oxide (Al_2O_3 , Fe_2O_3).. .. .	1.78	1.64	1.50
Lime (CaO)	46.55	49.33	49.75
Magnesia (MgO)	0.22	0.22	0.67
Phosphoric anhydride (P_2O_5)	0.28	0.19	0.12
Carbonic anhydride (CO_2)	36.41	38.49	38.76
Moisture and organic matter	1.74	1.05	1.20
Alkalies and undetermined	1.90	1.56	1.26

100.00 100.00 100.00

- (1.) Amuri limestone at contact with glauconitic calcareous sandstone, in gorge of Weka Pass Creek above railway-viaduct.
- (2.) Uppermost layer of Amuri limestone in same locality as (1).
- (3.) Hard Amuri limestone, about 35 ft. below upper surface, in same locality as (1) and (2).

	(4.)	(5.)	(6.)	(7.)
Insoluble in acid	11.75	16.97	9.30	28.20
Calcium carbonate (CaCO_3)	83.75	75.73	86.60	66.60
Phosphoric anhydride	0.52	1.21	0.16	0.27

- (4.) Pebbles of Amuri limestone in glauconitic calcareous sandstone, same locality as (1), (2), and (3). The sample appears to be very slightly phosphatized.
- (5.) Amuri limestone, near upper surface, some distance up valley of Weka Pass Creek above railway-viaduct. The analysis shows slight phosphatization.
- (6.) Amuri limestone, 30 ft. below upper surface, in same locality as (5).
- (7.) Amuri limestone, 50 ft. to 80 ft. below upper surface, in same locality as (5) and (6).

	(8.)	(9.)	(10.)	(11.)	(12.)
Silica (SiO_2)	7.25	14.45	34.95	22.51	5.79*
Alumina (Al_2O_3)	0.66	1.03	6.44	3.92	n.d.
Ferric oxide (Fe_2O_3)	0.54	0.77	2.76	2.08	n.d.
Calcium carbonate (CaCO_3)	88.64	81.56	47.62	67.60	33.91
Magnesium carbonate (MgCO_3)	0.45	0.61	1.46	0.80	n.d.
Calcium oxide (CaO)	..	..	1.50	0.80	23.63
Phosphoric anhydride (P_2O_5)	n.d.	n.d.	n.d.	n.d.	17.45
Organic matter and water	2.06	1.58	13.50	2.29	4.86
Undetermined	0.40	..	1.77	..	14.36
	100.00	100.00	100.00	100.00	100.00

* Insoluble in acid.

- (8.) Amuri limestone: Average sample from thickness of 40 ft. This and the following three analyses are of samples collected by Professor James Park a number of years ago.
- (9.) Amuri limestone, 2 ft. below upper surface.
- (10.) Weka Pass stone, 2 ft. above the Amuri limestone.
- (11.) Weka Pass stone: Average sample "from Waikari end of Weka Pass, from cliffs on north side of stream, a few chains above the railway-viaduct."
- (12.) Analyses by W. F. Skey of phosphatic nodules "from greensand band at base of Weka Pass stone," quoted by McKay in 1887 (10, p. 84), and partly recalculated by the present writer.