

PIONEER RAINFALL OBSERVERS IN THE MALTESE ISLANDS

by

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When John Davy, Army Surgeon, brother of the more famous Humphry Davy, visited Malta in the late 1830's he sought out such scientific information as was available concerning the climate of the island. He could find temperature data and a certain amount of general information regarding rainfall, but, as he wrote on his return to Edinburgh, "The quantity of rain which falls annually in Malta has not been measured." (1) This was true at the time of his visit but not when he wrote, for tragic events in the Islands had stimulated a Maltese colleague, Dr. G.C. Grech Delicata, into taking measures to amend this omission. (2)

During each of the seasons 1838/9, 1839/40 and 1840/41 rainfall had been pathetically small. These reasons were still remembered fifteen years later, when another physician Dr. Zammit wrote, "Dal 1839 (inclus) per esempo fino al 1855 (exclus) sopra 15 anni acquosi a varie proporzioni si avrebbe a diffalcarne le cifre di due perfettamente aridi (1839/40)". (3) Later he makes the point again, in those two years, "Una stilla d'acqua ne fosse venuta giù." (4) The results of this drought were described in May, 1841 by an English eyewitness; "The country is quite ruined. The great drought of the last and two preceding winters has quite dried up the ground. All the crops have failed (and) There will be much migration." (5)

The autumn of 1841 must have been an anxious one for the Maltese people and especially for the farmer, scanning the north-western sky for rain-bearing clouds, chewing carob beans to allay the pangs of famine and, no doubt, praying for the aid of his patronal saint. The prayers were answered, and by mid-December a joyful press was able to announce that, although rain had not come till October 17th, already half as much had fallen as throughout the whole of the previous autumn and winter. (6) The amount measured was four inches, and another six were to fall by the end of the year.

Since this precise comparison with the preceding year was possible it must be assumed that some measurements had been made throughout the wet season 1840/41 and that the total was of the order of eight inches. Since rather more than two-thirds of that had come early in 1841, there was perhaps justification for Zammit's assertion that hardly a single drop had fallen during 1840. No more pre-

1. Davy, J. "Notes and Observations on the Ionian Islands and Malta."
2. The assertion of Agius (Agius, T., "Climate of Malta" in "Malta and Gibraltar Illustrated" Ed. Macmillan, London, 1915) that the first pluviometer records date from 1822 to 1826 and were published in the 'Gazetta di Malta' is erroneous and results from a mis-reading of his source, Miège (Miège, M. "Histoire de Malte", Paris, 1840).
3. Zammit, Dr. N., "Ricerche Idrauliche", Malta, 1855.
4. Zammit, op. cit.
5. Quoted in Davy, op. cit.
6. 'Portafoglio Maltese' No. 189, p. 1608, Malta, 1841.

cise record of the rainfall of 1840 has survived, but Dr. Delicata who was almost certainly the source of these press announcements, published monthly totals of rainfall covering the calendar years 1841 to 1855. (7) No other entered the field until 1851.

Until the end of 1842, Delicata obtained his readings from a gauge at the Military Hospital, Valletta (formerly the Hospital of the Knights of St. John), but later his material came from the observatory of the 'Società Medica D'Incoraggiamento di Malta' of which he was a leading member. The observatory was on the roof of the University building, a site still used for this purpose. Somewhat garbled versions of Delicata's data appeared in contemporary issues of the Italian language newspaper "Portafoglio Maltese". (8) These reports, credited to a 'pluviometer in Valletta', were just sufficiently accurate to reveal their origin. Reports to the "Società Medica" were, on occasion, wildly astray, as for the autumn of the year 1843: September, November, and December are credited with 28.1 inches, 16.7 inches and 22.5 inches, yielding an annual total of 76.5 inches! (9) Reality is more sober: 1.47 inches, 3.30 inches and 2.28 inches, with the total for the year a below-average 15.76 inches. (10) It is fortunate that Delicata had a more cautious approach than his colleagues, and doubly so in that he decided to publish a paper on the subject in 1856. The stimulus here may well have been the appearance of Zammit's 'Ricerche Idrauliche' in the previous year, or perhaps merely an awareness of the need for the long-term view.

A daughter society of the 'Società Medica' was the 'Società Economico Agraria'. Delicata was, from time to time the Honorary Director of the Society's experimental field at a site now covered by the suburb of Hamrun. The opportunity to install a second rain-gauge was not missed, and Delicata himself communicated his results to the Society along with his reports on the working of the farm. (11) Observation continued from November 1844 at least till the end of 1849, but unfortunately Delicata's second report, with material of the second half of 1845, was not printed, and has failed to survive. Material for the later years was published in the annual 'Yearbook' of the Society. (12) Yet another doctor, N. Zammit, medical officer at the Corradino Prison, Pawla, applied his scientific training to the study of hydrological problems. He designed and constructed instruments for the measurement of dewfall and evaporation and the results from these together with his rainfall measurements were discussed in a pamphlet 'Ricerche Idrauliche.' (13) Unfortunately his careful approach to measurement was not backed up by thorough publication, and, apart from a few daily examples, only his annual rainfall data are available. Yet these are not without interest:

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7. Delicata, C.G. "Della Quantità di Acqua che Cade Annualmente in Malta". Vassalli, Malta, 1856.
 8. 'Portafoglio Maltese' pp. 1679, 1757, 2075, 2192, 2523, 3096 and 3504, Valletta, 1841-1846.
 9. Società Medica, "Storia della Società Medica d'Incoraggiamento di Malta" Vol. I, no date.
 10. Delicata, op. cit.
 11. Delicata, C.G., "Rendiconto degli Sperimenti....." Malta 1846.
Delicata, C.G., "Rendiconto terzo.....", Malta, 1847.
 12. Società Economico Agraria, "Calendario dell'Agricoltore per l'anno 1849" Malta 1849.
Società Economico Agraria, "Calendario dell'Agricoltore per l'anno 1850" Malta 1850.
 13. Zammit, Dr. N., op. cit.

Year	Number of falls of rain	Largest quantity falling in one time	Longest period without rain	Annual Total
1851	72	2.68"	123 days	17.99"
1852	46	1.77"	83 days	13.53"
1853	39	2.65"	159 days	18.27"
1854	54	2.60"	87 days	16.05"

When, in making a point, Zammit required more material than his own small observatory provided he drew from the records of the Army's meteorological station which had been established on the Valetta ramparts at St. John's Cavalier in March 1852. Throughout the second half of the nineteenth century, the British Army was acutely concerned with the health of its units overseas; especially where the local climates were thought to be detrimental, it attempted to evaluate them. In Malta, measurement was at first in the hands of the Royal Engineers, but from 1865 the Army Medical Department itself assumed responsibility and, as a matter of convenience, the observatory was therefore removed to the Garrison Hospital — to the site, in fact, where Delicata had worked twenty-three years earlier. (14)

It is from the Royal Engineers' observatory that the earliest manuscripts survive. These are now held by the Meteorological Office, Harrow, England and are complete from April 1852 to December 1854, with the exception of 1st. July to 3rd October of the latter year. The manuscript is resumed with June data 1857 and ends with August, 1861. The 1865 manuscripts of the Army Medical Department were destroyed by fire, but an abstract was preserved. In 1890 summaries were prepared from the surviving manuscripts of both the Royal Engineers and the Army Medical Department, (1866-1886) which, with the 1865 abstract, were published by the Meteorological Council in a volume which is invaluable for climatological study in many corners of the world. (15)

Greater continuity of observation at these military stations than is indicated by surviving records is suggested by a report on Malta's water supplies by J.F. Bateman. (16) In May, 1867, he wrote, "I have before me the returns of the rainfall during fifteen years . . . since 1851, with the exception of 1860, and 1862." Unfortunately he quotes only three annual totals:

1852	8.27 inches
1855	15.70 inches
1866	10.49 inches

The first value is the Royal Engineers' total measurement for that year, but it is not acceptable as an annual total since measurements did not begin mid-March. The last is the Army Medical Department's value, and it is reasonable to assume therefore that the 1855 total came from the Royal Engineers' manuscripts which were subsequently lost. Since Bateman handled material, now lost, for the years

14. The information of this and the following paragraphs is based on an examination of the manuscripts held by the U.K. Meteorological Office to whose Director thanks are due for access to them.
15. Meteorological Office "Meteorological Observations at the foreign and colonial stations of the Royal Engineers and the Army Medical Department, 1852-1888." London, 1890.
16. A report to the Duke of Buckingham, Secretary for the Colonies. It was printed by Seddal, Rev. H., in "Malta: Past and Present". London 1879.

1855, 1856, 1857 and 1863 and 1864 it is most regrettable that his report was not more informative. The latter two years he describes as "years of average rain". An alternative, but not wholly reliable source supports this observation with totals of 25.01 inches and 20.68 inches respectively. (17)

Failure fully to investigate or acknowledge basic sources has been an occupational disease of many writers on Malta's rainfall. Bateman was no exception, nor was the Rev. G.F. Townsend who wrote a guide to the Islands in 1869. (18)

In his chapter on 'Country Excursions' he published two sets of meteorological material. The first, with due acknowledgement to the Quarter Master General and Inspector General of Hospitals is a summary of air temperature observations for the months of 1868. The other, "Rainfall Return from 1859 to 1868" follows immediately after, but comparison shows that the material came neither from the Royal Engineers nor the Army Medical Department. Where then, did Townsend obtain these data? The Royal University in Valletta have a book of manuscript abstracts of monthly totals from a series of raingauges throughout the Islands. All but one of these gauges were at Government Schools: the exception was at the Public Library, Valletta and its returns represent the rainfall of the city from October 1868 to December 1869. The values recorded for 1868 agree exactly with Townsend's publication, so that for those months his source is known. It might be argued that, unless a uniform series were available, he would have drawn upon the Royal Engineers and Army Medical Department material to which he had access. This he did not do, and therefore it might be assumed that the material which he published did form such a uniform series, drawn from a single source. If this were so, then a series of observations at the Public Library commencing in 1859, or earlier, would be indicated. However, there are difficulties in the way of ready acceptance of this view. In particular, statistical work on the series suggests a serious lack of homogeneity between the earlier and later material. (19)

The manuscript volume of returns from schools shows that in October 1868 four schools sent rainfall reports to the Director of Education, for the next twelve months they were joined by another and thereafter first eight, then nine, then ten and, for one or two short periods as many as fifteen schools were participating.

Enemy action destroyed the manuscript material for the decade commencing June, 1891, but some of the missing monthly totals were preserved by contemporary publication in the Government Gazette. However, no record from this source has been traced for more than a few isolated months during the period 1897 to 1901.

The observatory at the University, begun in a modest way by Delicata in 1843, had been revived by 1878 when the University itself undertook an ambitious programme of measurements and observation. Unfortunately the manuscript record ends abruptly in mid 1879 and it is thought that the observatory declined until 1900. (20)

17. Blue Book for Malta, 1880.

18. Townsend, Rev. G. F., "English Hand Book of Malta" Chap. VI, 1869.

19. As will be shown in a paper prepared by the writer which it is hoped may be published in the Quarterly Journal of the Royal Meteorological Society.

20. The writer is deeply indebted to the Rector Magnificus, the Registrar and the Professor of Physics of the Royal University of Malta for access to the various manuscripts in their care and for answering his many queries.

However two other Jesuit foundations, the seminary at Victoria (Rabat), Gozo and St. Ignatius' College, St. Julian's Malta were very active during the period. Help in establishing these stations came from the fraternal establishment of Stonyhurst in Lancashire, which had already become famous for its work in meteorology, astronomy and terrestrial magnetism. A set of instruments, supplied by the well-known firm of Casella and verified at Kew, were supplied, and presented by the Rector of Stonyhurst to the Rev. J. Scoles, S.J. at St. Julian's (21) and the Rector may also have contributed to the Gozo station. In Gozo it is known that wind velocity and direction, humidity, visibility, maximum and minimum temperatures, rainfall and the state of the sky were all observed. In addition there was a chronometer, and a gun was fired daily at noon. (22) It seems unlikely that any record of the Gozo enterprise remains, although it is known that a report was sent to Stonyhurst in 1886 and this may be preserved in the archives there. (23) Fortunately the comparable material from St. Julian's was recorded in the Stonyhurst College observatory reports. Observations were maintained from 1883 to 1909 in Gozo and from 1883 to 1906 in Malta but publication was discontinued after 1902. (24)

Osbert Chadwick, who was appointed as Government waterworks adviser, arrived towards the end of 1883. In his early days in the island most of the public water supply came from the perched water table of the western plateau. He therefore established rain-gauges on the plateau, first at Dingli, and subsequently also at six other sites. It is said of Chadwick that he regarded the first duty of an engineer to be the making of a measurement; his second, the making of a better one. Despite these high ideals, his data as published in his reports to Government are occasionally contradictory. (25) For example, in 1886 a total monthly rainfall of 0.180 inches is given for April 1885; in a later report (1896) he gives 0.380 inches. From 1888 a daily manuscript register had been kept by the Water Department and still survives. Where Chadwick's published values can be checked against this manuscript a number of errors, some serious, have been noted:

Inches	1892		1893			1894
	Nov.	Dec.	Jan.	Oct.	Nov.	Feb.
Chadwick	6.033	1.019	2.667	3.441	4.004	3.922
Ms.	7.23	2.45	7.08	3.48	4.068	4.867

(Ms. values kindly supplied by the Chief Engineer, Water Dept. Malta).

21. Stonyhurst College Observatory Report, 1883. Appendix. "Results of Meteorological Observations..... Malta 1883" p. 85.
22. Information provided by Rev. Joseph Meilak, S.J. of Victoria Gozo.
23. Stonyhurst College Observatory Report, 1886. "List of Presents Received".
24. Stonyhurst College Observatory Reports, 1883-1902. In the Report for the year 1903, the Stonyhurst Director regretted ".....the untoward circumstances which have resulted in the failure of the Malta meteorological returns, after long waiting for them."
25. Chadwick, O. "Abstract of the rainfall recorded at Dingli 1884/85." 1885.
 Chadwick, O. "Report on the Rainfall of Malta and the Yield of Springs, 1885/86." 1887.
 Chadwick, O. with G. C. Schinas "Report on the Rainfall and yield of Springs 1886/87." 1888.
 Chadwick, O. "Report on the Water Supply of Malta." 1896.

The installation of Chadwick's plateau stations marked the last expansion of effort in the nineteenth century, though the twentieth has seen some development as well as retrogression. All the known nineteenth century rainfall observations are listed in Table I. Sight should not be lost of the possibility that additional manuscript records may yet be found amongst family papers or in other collections.

TABLE I. LIST OF NINETEENTH CENTURY RAINFALL OBSERVATIONS

<i>Years</i>	<i>Authority</i>	<i>Site</i>	<i>Notes</i>
A. 1841-42	Delicata	Garrison Hospital	
B. 1843-55	Delicata	University	
C. 1844-49	Società Economico Agraria	Hamrun	
D. 1851-54	Zammit	Corradino, Pawla	Annual Totals
E. 1852-61	Royal Engineers	St. John's Cavalier	
F. 1856-80?	Townsend and Mss.	Public Library	Many values doubtful
G. 1865-86	Army Medical Department	Garrison Hospital	Site as 'A'
H. 1868	Education Department	Various Schools	
J. 1878-79	University	University	
K. 1883-1909	Seminary, Gozo	Victoria	No. Data survive.
L. 1883-1906	St. Ignatius' College	St. Julian's	
M. 1883-date	Water Department	Plateau	

In this paper attention has been concentrated on one aspect only of the work of the early meteorological observers of Malta: the measurement of rainfall. That is not to minimize the significance of their other work, but simply to stress the importance, in the Maltese context, of rainfall and its measurement. One noteworthy feature of the record is that only one of the observers (Chadwick) was directly concerned in a professional capacity whilst the contribution of educators and, especially in the early period, of physicians, will not have escaped the reader's attention. Without all this, largely amateur, effort our total knowledge of Maltese precipitation would be much less rich than it is. To take but one example, the reports from St. Ignatius' College include what may be a unique observation of snowfall in the Islands. (26) Also, without their work, we would be deprived of a most valuable background series of monthly rainfall values covering sixty years of the nineteenth century against which the economic, and especially the agricultural, history of the period may be viewed. (27) We are much indebted to them.

26. Stonyhurst College Observatory Report, 1891. Appendix, records that in January 1891 standing water on the Marsa behind Valletta was frozen over on the 25th, and snow, not hail or sleet, fell during a period of eight hours at Notabile and Dingli about the 19th of the month.
27. A 116 — years tabulation of Valletta monthly rainfall values, continuing the nineteenth century material into the 1950's appears in Mitchell, P.K. "Studies in the Agrarian Geography of Malta", Part I "Moisture Characteristics of the Climate." Report to C.E.R.C., Durham. 1959.