REFUSE AND ITS REFLECTIONS ON MAN: BOTH PAST AND PRESENT

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I.

"O tract of tyme, that all consumes to dust,
We hold thee not, for thou art bald behinde:
The fairest sword, or mettall, thou wilt rust,
And brightest things bring quickly out of minde.
The trimmest towers, and castles great and gay
In processe long at length thou doest decay.
The bravest house, and princely buildings rare
Thou wasts and weares and leaves the walles but bare."

Thomas Churchyard's Worthiness of Wales.

INTRODUCTION

Refuse can be defined as rejected or useless material of any sort. Every creature produces waste. Man from his very earliest existence threw away material such as flint, animal bones, shells etc. and as he became more inventive; broken tools, pottery and disused housing and clothing materials.

From man's refuse it is possible to tell much about his life style, i.e. what he ate and how he procured and cooked it, also his clothes, activities and liesure time pursuits. As history has progressed, the refuse (both the content and method of disposal) has changed, reflecting the life style and social conditions of the people.

At present in Ireland, as our population increases and standard of living rises, the refuse problem grows. Therefore it is necessary to devise methods of clean, efficient and benificial disposal of wastes.

EVOLUTION OF MAN

There are still many gaps in the story of man's evolution. Most of the knowledge has been pieced together from fossil evidence, discarded tools and bones, comparing anatomies and behavioural patterns.

Monkies, apes and man have evolved in separate directions over the last 40 million years. There are strong biological relationships between man and the ape,eg. prehensile grip, flexible shoulders and arms, and similarities in the skeletons. Also the unecessary length of man's intestines show that he once was vegetarian. The size of the cranium gives an indication of the stage evolution has reached,as the main difference between man and the ape is one of mentalcapacity. But fossil evidence and refuse material have given perhaps the most clue to the evolution of man.

All fossil evidence of the early hominids is to be found in Africa. Man was vegetarian at first which is shown by the teeth of Ramapithecus dated to 14 million years ago. Ramapithecus evolved (probably not directly) from the first recognized hominid types; Proconsul and Dryopithecus. By natural selection, the man with the best adapted features will survive.

The ability to make tools depends on mental and physical ability and the co-ordination of both. The first man to use primative tools to a definite degree was Australopithecus (A.africanus & A.robustus). The stone tools they used are called eoliths- but it is debated whether they were natural forms utilized by man or if he actually made them.

Tool making develops as a result of communication, memory, a definite social order and everything that goes with a thinking, reflecting and social being. But the use of tools results in the possibility of making clothes, cooking and constructing dwellings. Homo erectus (700,000 years ago) stood upright and had a definite social community. He used tools extensively and was therefore able to colonize a much wider area, moving into temperate latitudes.

Neandethal man evolved next. He populated Asia and Europe which were not inhabited until about 500,000 years ago. But man did not evolve simultaneously in all parts of the world. No human cultures ever evolve at the same rate or in the same way. Modern west Eurasian man is called Cro-magnon man and has evolved directly from Neanderthal man. In many parts of the world there are still groups of people living in a manner and using tools of 1000's of years ago. The Aboriginees are a stone age culture and have been evolving along side 'modern' man for a few hundred years. We can learn much about previous civilizations by studying tribes such as Aboriginees, Eskimoes and the Bushmen of the Kalahari Desert.

CLASSIFICATION AND DATING

Classification of any kind is a generalization and therefore has limitations. Emphasis should be placed on a cultural rather than a chronological aspect. Lack of outside influences(and particularly in Ireland) means that certain cultures may exist undisturbed for long time spans, often parallel to a technologically more advanced group.

It is very important to have an efficient dating system, but it is a problem as there are no'anchoring points'. All data has to be inter-related to make a chronoligcal plan. Knowlege of climate, vegetation and general environment has brought about several methods of dating:

I. Geo-chronology _ this is a geological dating system. The relevant part to archeology is the dating of glacial remains (eg. by varves)

2. Pollen analysis. This relies on the fact that different plants live in different climatic environments. The climate changes slowly all the time.

3. Snail dating. This depends on the fact that certain molluscs live in certain climatic conditions.

4. Dendro-chronology. This is tree ring dating.

5. Relative chronology. Relation of objects and cultures to each other. It is based on: i. stratigraphy (levels in the soil at which objects occur)
ii. typology (development and degeneration of types)

6. Radio carbon I4 dating. There is a scientific method of measuring the levels of carbon I4 which decreases with age . A similar test can be done with flourine.

DATE	CULTURAL PHASE	CLIMATE	FORREST DEVELOPMENT	GENERAL REMARKS
70000000				Proconsul Dryopithecus Ramapithecus Australopithecus (A.robustus & africanus) Homohabilis Homo erectus Neanderthal man (homo sapiens)
14000000 2000000				
1800000 700,000 100,000	Lower Paleolithic	Pleistocene		
			Tundra Vegetation	
40,000	Middle Paleolithic			Paleolithic Age not present in Ireland
20,000	Upper Paleothic			
10, 000		warmer zone		
8,800		cold regression		Cro-magnon man developing
7,000	Early Mesolithic	post-glacial Atlantic	hazel wide-spread. ash & pine. oak &elm colonise. growth raised bogs begins	
4,500				Most known sites are secondary
2,500	Late Mesolithic		pine declines alder arrives and spreads. forest high up mtn.sides & reaches w. coast.	
2,000	Neolithic			Neolithic continues parallel to Bronze Age
1000	Early Bronze	sub-boreal (warm & dry)		
500	Late Bronze		forests diminish. rapid turf growth	
A.D.	Early Iron Age			
200				
450	Late Iron Age	sub-Atlantic (ie.modern)		
450	Early Christian			

LOCATION AND ENVIRONMENT

The geographical environment in Ireland has been the predominant influence on mankind. Being an island on the extreme western edge of Europe in the Atlantic Ocean means that in many ways Ireland has suffered from isolation. Land links with the British Isles were submerged after the Pleistocene (ice) age. This means that Ireland was not very accessible. Man was late to arrive in Ireland, Paleolithic man seems never to have arrived here at all. Some civilizations by-passed us almost completely, the Romans never actually colonized Ireland, although some of their artifacts have been found but mostly because they came in by trade.

The climate (in particular) and geology, therefore soils, are changing slowly all the time. The climate determines where man lives and what he can grow. Soil vegetation and geology and climate are all interlinked. Bogs for example were restricting for habitation but they harboured game. They have become very important in the last few hundred years as a fuel supply. Soil is the most important influence perhaps. Here the soils are basically determined by glacial deposits rather than by the underlying rock. The Pleistocene period had an enormous effect on the environment. There were several periods of glaciation interspersed with warmer weather. The ice sheets reached southwards as far as an approximate line from Wexford to Tralee. When the ice melted it left deposits of rich glacial muds, boulder clays, drift soils as well as eskers and drumlins in the lowland areas. The highland places were left denuded & infertile with thin soils and rocky outcrops. Settlement was usually confined to the rich glacial soils.

So when man eventually arrived here , there were site limitations due to dense woodlands and later bogs (bog growth began about 5000 B.C.) Sites could be made on the top of drumlins, eskers, in the sandhills, along the shores and on river and lake sides. Hill slopes between 600 - 1000 feet above sea-level were also inhabited. Sea-level fluctuated as there was an isostatic recovery of the land after the weight of the ice was removed leaving raised beaches. But there was later submergence of the land combined with a raise in sea-level leaving submerged forests and turf bogs. Modern sea-level is now between the height of the raised beaches and the level of the original beach.

PREHISTORIC MAN

When man was purely vegetarian he left very little waste or refuse. He peeled bananas, tangerines and then threw away the skins which rapidly decomposed. But he had no tools or no specific dwelling place. Therefore he left no durable organic or inorganic waste.

The Eolithic period is the dawn of Stone Age man.

PALEOLITHIC (Old Stone Age)

Early Stone Age or Paleolithic man is perhaps the first type of man to be regarded as becoming civilized. Most of his refuse was left to pile up on the floors of the caves where he lived for shelter. Charcoal remains and hearths show that he used fire to cook his meat (and keep himself warm). He was a hunter and scavenger and made rough tools of flint.

The study of bones found in paleolithic man's refuse (Australopithecus africanus) show that he lived on a varied diet ranging from rhinoscerous to tortoises and birds eggs. Refuse of another species of paleolithic man (Homo erectus) showed him to be a scavenger, hunter and cannibal. The bones in the refuse of Neanderthal man showed that giant cave bears formed part of the diet. But Neanderthal man also made shallow graves for his dead and the skeletons of some of them show that they were deformed and could never have survived had there not been strong community support and food sharing.

Remains of the earliest known huts of Paleolithic man have been found at Terre Amata in South France. They have been dated to 300,000 years ago.

There is no conclusive evidence for Paleolithic man's presence in Ireland. Numerous caves that would have been south of the furthest extent- of the ice sheets have revealed nothing. Some of them have shown remains of animals of the type that lived in the Pleistocene Age. In the 19th century bones were found at Castle Pook caves, Doneraile, Co. Cork. They were from wooly mammoth, brown bear, wolf, Irish giant deer ("Irish elk"), and spotted hyena (only bones of hyena ever found in Ireland).

Kilgraeny cave in Co. Waterford produced human remains in association with giant deer but R.C.14 dating gave the bones a Neolithic date. The deposits on the cave floor had been much disturbed.

The Drogheda flint flake picked up by F. Mitchell in Drogheda glacial deposits was definitly of Paleolithic origins "even though the flake is no more than a piece of knapper's waste". It has been suggested that it was deposited on the eastern shore because it was picked up by advancing ice and then deposited when the ice melted. So it possibly originated in the basin of what is now the Irish Sea. This is the nearest so far discovered that Paleolithic man came to Ireland.

MESOLITHIC (Middle stone age)

The first man to definitely inhabit Ireland was Mesolithic man, and the earliest of them had arrived by about 7000 B.C. They may have been following red deer herds which were retreating from the warmer conditions of the Boreal period. They came across from Scotland where there may have been a landbridge (if not, the sea level was certainly much lower). They settled first on the north-east coast and then moved southwards and into the midlands. They lived by hunting, fishing and fowling and collecting edible roots, berries and other plant food, therefore living a semi nomadic life. They knew nothing of agriculture, pottery making or metal working.

Two types of site are in evidence, primary sites which were actual habitation sites, and secondary sites, which show habitation refuse for example flints bones etc.which by the action of the sea, have been redistributed. They appear to have built base camps because post holes were found at Mount Sandel near the River Bann, indicating fairly substantial houses. There were tranchet axes and also many microliths (small carefully worked slivers of flint). The site unfortunately did not produce any organic refuse as it was built on a dry hill, therefore everything decomposed. This site has been dated between 6650-6550 B.C.

Flints found discarded show that Mesolithic man had a diversity of implements. The microliths were used as points and sharp edges of barbs and arrows, as well blades and axes. Other instruments made of flint were scrapers, planes, picks, borers, hammerstones and also gravers for incising bone and wood. In Larne, Co. Antrim, much debris has been found from Mesolithic sites that have been washed away and the flints deposited on raised beaches when the sea-levels rose temporarily. (The people of this stage of the Mesolithic are often called Larnians.)

A It is possible to tell from the flint debris how the tools were made. A nodule of flint was broken to make a striking platform, and the flakes were struck from a flint core. Some of the flints were given secondary working along the edge. The pebbles were made into flakes and the nodules into larger tools.

On the shores of the Bann, leaf shaped flakes have been discovered, some found with moss handles, some in groups indicating that they were used as multiple pronged fish spears. Also there, amongst the diatomous deposits, layers of ash have been found, possibly where fish were smoked. Shale and slate 'clubs' and perforated stone net and line sinkers were found at shallow places like the outflows of lakes where there would have been the maximum congregation of fish. Strangely, there is a complete absence of hooks.

C D B On the sea shores shell fish were readily available. On some shores Mesolithic kitchen middens can be found, with shells such as cockles, oysters, limpet and periwinkles. Debris of brittle stones show us how they cooked them. Wooden

troughs full of water were made to boil by placing in them stones heated in the fire. Charcoal analysis produced evidence of trees such as oak, apple, hazel and hawthorn which thrived in the Atlantic period, which was the climatic type when Mesolithic man inhabited Ireland.

Similar activities took place in the midlands by Larnian type people. Instead of flint many of the discarded tools show that they were made of chert which is a hard rock occuring in carboniferous limestone. In the turf numerous isolated fires have left ash and charcoal in association with chert flakes, hazel nut shells and charred and uncharred seeds of the water lilly. At Cushendun Co.Antrim the charcoal has been dated to about 6000 B.C. The pollen gives evidence of hazel, birch, oak and elm. Shellfish remains, bones of cod, one vertebra of a wild pig and flints of the small blade type all suggest their diet and occupation.

> Frank Mitchell's description sums up the Mesolithic culture:
> "We can picture parties of Larnian folk coming here in Maori style in early autumn, setting traps for fish in the fen channels, coll- and perhaps parching water lilly seeds, gathering hazel nuts and giving a preliminary dressing to blocks of chert, carrying away the semi worked pieces to be finished elsewhere."

He goes on to say:

> "We urgently need to find residential sites where we shall find the tools with which the sophisticated objects in wood and bone were fabricated (not just the waste fragments which were discarded by the thousand) And we need wet sites, where organic materials and objects fashioned from them has survived together with food debris and other potentially informative rubbish."

Some of the'pontially informative rubbish' may be found underneath the midland bogs. Recently Ryan has discovered an early mesolithic sattlement at Lough Boora, Co. Offaly showing that mans earliest habitations in Ireland were not mainly confined to the north and north-east coasts. It was previously thought that the bogs were too inhospitable to support man. But the site is actually underneath the bog, proving that it was colinized before the bog grew, indicating a great age. It is hard to be precise about the beginning of bog growth. Radio carbon dating from hearths have shown it to be between 6525 and 6400 B.C.

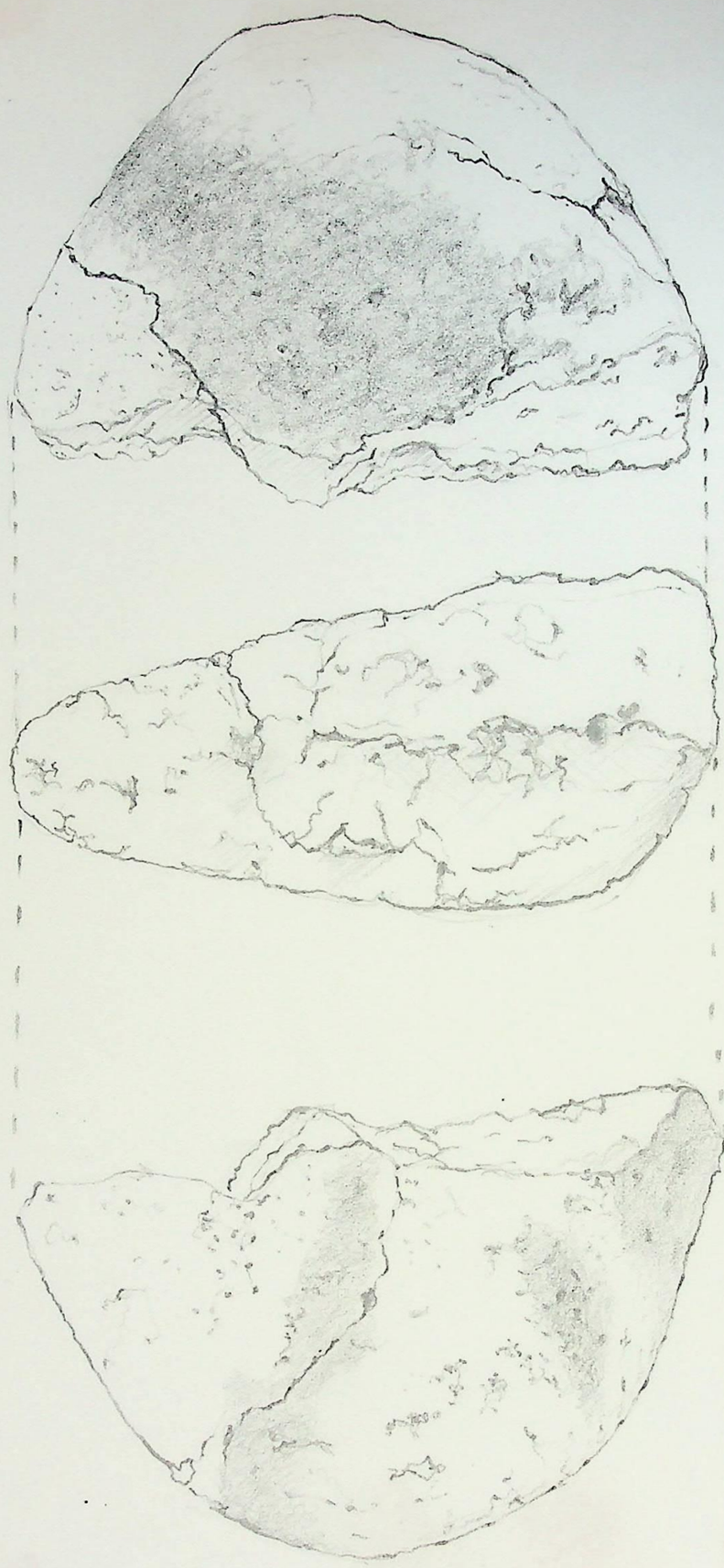
The bog has preserved much of the organic material, mostly refuse. A number of areas are rich in charcoal, burnt bones and the characteristic debris from making tools in chert. Microliths of the type used to tip arrows were found in hearths in conjunction with mammal bones. But very few microliths were foundin burnt areas where there were alsofish bones. This indicates that the microliths wedged themselves in the mammals flesh and fell out during cooking -" or may even have been spat out - when the roast meat was eaten- the mesolithic equivalent of lead shot in the pheasant!"

The bones found on the site tell us much about the diet of mesolithic man (the final zoological examination is yet to be done). There are bones of deer, wild pig, hare and dog. The pig bones are from particularly immature specimins perhaps they were easier to trap and capture. The fish bones are from fairly small species and the bird bones are from nothing larger than duck. Hazelnuts formed part of their diet and also suggest that the site was occupied during the early autumn. After pollen grain analysis and more detailed study more information will become available.

On the rest of the site, little charcoal was found, but large quantities of waste chert was discovered. Cores of chert which were fluted by the action of striking off flakes, as well as the finished tools, indicate areas devoted to implement manufacture. The range of tools was restricted, microliths being the most common and scrapers rare. Of particular importance were four complete axe heads of polished stone. (These are usually associated with Neolithic culture)

The bogs may conceal many more prehistoric sites preserved underneath it, and as Bord na Mona extracts the lower layers of turf, they will probably come to light.

A Waste flakes - from Crannog at Loughnagranshy, Lough Gara. Co. Sligo.



Side 1

broken centre

side 2

B Stones (broken, cracked & charred) from a kitchen Midden at Inch, Dingle Peninsular, Co. Kerry.

C

More Kitchen middens are becoming exposed at Maghaglass Sandhills - Inch (Dingle Peninsula) They are preserved underneath the sand for many years before they are uncovered. In 1912, Rev W. P. Carmody and A.G. Wilson described the middens: "It appeared to rest on the surface of an old raised beach, to have been covered by later dunes and then to have been re-exposed. We found the deposit to consist chiefly of cockles, but there were many mussels, a considerable number of limpets, and a few other marine molluscs. Charcoal and other traces of fire were visable and there were several hammer stones, and "grain rubbers" broken and whole. The cockle shells on the surface had been bleached to a very considerable snow white." (54)
Kitchen middens are not confined to prehistoric times but were in use into the present century. When Carmody and Wilson asked a local farmer about the middens, the reply was: "Oh yes, the people of this place do be boiling cockles there every year" (55)

D
Cockle shells are the most common.
Charred and broken stones are in evidence.

E
The presence of a hearth is indicated by the lump of charcoal.

NEOLITHIC (New Stone Age)

The Neolithic way of life began in the Middle East and reached South-east Europe before 5000 B.C. The first Neolithic influences appear in Ireland after about 3500B.C. Their refuse piles show that they cultivated crops and kept domestic animals. They had a variety of stone implements and pottery.

The agriculture was of a shifting nature, but more permanent houses were made as crops were sown. They probably ring barked, therefore killed the trees, letting the essential light into the crops, enabling them to cultivate soft soil free of sod (which is hard to work) Little remains are left as the trees grew up again soon after the site was vacated, therefore most evidence has been destroyed. An increase in pollen counts of plants such as ribwort, nettle and dock indicate that they colonized as soon as the woodlands (elms) were cleared by man.

Humphrey Case describes the movement and migrations of Neolithic man in the Irish landscape:

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> "communal movement implies the transportation of men, women and children and infants, together with breeding and milking livestock and seed corn. Such an Odyssey could only take place at a certain time of the year, probably between August and November, when the crops had been harvested and there was still good grass, and fodder along the route. The route to be followed would have been well prospected because once the crops had been sown, a limited number of able bodied men could have gone out in scouting parties, carrying some food but also existing in Mesolithic style by hunting and food gathering."

Scouting parties probably crossed over to the north of Ireland followed by their families and stock in much the same way.

The variety of flint tools was wider than in the meolithic. There were tanged points, end, and side fish tail scrapers and perforators, also choppers, picks, gravers and odd flakes. But additionally they had chipped core axes and leaf and lozenge shaped pieces (arrow and javelin heads). The quality of secondary chipping as well as the amount of it had increased with the Neolithic. The tools were not necessarily made of flint. Rathlin Island produced much debris from an axe making 'factory' of porcellanite rock. Perforated stone implements have been found, probably used as weights for a digging stick. The polished stone axe (with a wooden handle which has occasionally been preserved in bogs , eg. in Co.Monaghan) is one of the most important implements. It was also used as a digging mattock. At Belderg, Co. Mayo ancient plough marks from an ard have been recorded. It was the primitive fore runner to the plough and the marks have been dated to 2500 B.C. In the early Neolithic, an abundance of cattle bones combined with a lack of agricultural tools such as sickles and grinding tools indicate an emphasis on cattle rather than cereal farming to begin with. Roots and grains were probably planted with the digging stick. Saddle querns which are the simplest form of hand mill

occasionally appear showing that corn must have been grown and ground for bread.

Refuse piles of bones, charred and otherwise give evidence of both domestic and wild animals. The first domesticated animal was probably dog, followed by cattle, sheep (or goat) and pig. Later horses were domesticated.

Beef was the chief element in the Neolithic diet. The first records of domestic animals came from a scattered site dispersed by the sea at Ringneill Quay, Co. Down. Flints, bones and charcoal waste are found over a wide area (3340 B.C.) Bones of domestic ox, pig and either sheep or goat were identified. In 1954 Sean O'Riordan discovered seven sites at Lough Gur dating from the Neolithic but under habitation until the early Bronze Age. It was very well preserved because there are natural limestone terraces encouraging light soils therefore discouraging a heavy regrowth of woodland so there is some record remaining. All seven sites yielded bones of ox, pig (wild or domestic) , sheep or goat, dog, horse, red deer,and bear (showing that bear survived at least until this time in Ireland). The scarcity of remains of red deer as a source of meat is strange as there are many finds of worked antler. In Ballnagilly Co. Tyrone burnt hazel nut shells, burnt animal bones and teeth have also been found.

The Lough Gur site has provided other interesting information regarding the foundations of houses, both round and rectangular. Most of these had hearths and refuse pits inside them. The pits may originally have started as storage pits perhaps for corn and were later used for refuse.

The charcoal analysis shows that the fire wood was from bushes rather than forest trees. The types of woods in order of frequency of occurrance are as follows: hazel, ash, hawthorn, holly, oak, whitebeam, cherry, and pine. The dry limestone soil is indicated by the frequency of ash and absence of alder.

In Ballynagilly substantial housing structureswere also found (3100 B.C.) Post holes indicate how the roof was supported. A refuse pit was found with pottery sherds and boney debris.

Neolithic man is typified by pottery whereas Mesolithic man had no pottery. Lyles Hill ware is one of the best known types of Neolithic pottery. It has been found in quantity at Lyles Hill, Co.Antrim. In a charcoal deposit pottery sherds were found totaling over 100 pots. Many sherds have also been found at Ballynagilly in pits. Fragments show the bowls to have been round bottomed, and plain shouldered with turned out or beaded rims. The clay was mostly stone tempered but finely divided fire clay was tempered also. In one pit the rims showed rippling and burnishing.

It is possible to detect a sequence of pottery forms. Because pottery is breakable new ideas can be introduced and adaptations in shape and decoration can be made. But pottery is strongly traditional and techniques take a long time to change. Other Neolithic pottery types are Ballyalhar ware which is highly decorated. Sandhills ware is thick, coarse and stone tempered and much has been found at Ballynagilly and has been dated to about 2173 B.C. Carrow Kael ware is the most recent pottery type to arrive and it is crumbly and grainy. Neolithic pottery sherds are frequently found in kitchen middens.

Most complete pots are found in Neolithic tombs. They must have become powerful and thrived to have been able to erect such huge megalithic monuments as Newgrange. A date of 2500 B.C. has been put on Newgrange from charcoal debris used to caulk the gaps between the stones and boulders. In these monuments they buried their dead, after cremating them and supplying them with the necessities for after-life such as polished stone axes, arrow heads, scrapers and pottery vessels.

The Neolithic life style probably continued on well into the Bronze Age and possibly co-existed alongside the Iron Age too. Likewise the Mesolithic groups probably lived in the remote areas gradually becoming assimilated into the Neolithic culture.

F

Lough Gur stone circle (Grange townland) Co. Limerick has produced many pottery sherds of the late Neolithic and Early Bronze Age.

BRONZE AGE

Metal using man first came to Ireland around 2500 B.C. bringing his metal working skills and searching for new sources of ore. These metal tools made the task of living much easier. Size of tools was not so restricted, durability was increased and repair was possible. Less time was needed to cook, capture animals etc. and therefore more effort could be put into decoration and elaboration of design. Decoration is important as it developed into a specifically Irish type which can be recognized abroad, so a picture of trading can be built up. Also the evolution of decoration and design helps in the dating of artifacts found because a chronology can be developed. The Bronze Age can be divided into early and late, as the progress made between the first metal objects until the beginning of the Iron Age, is remarkable.

One of the earliest metals to have economic importance to man, was copper. Waste from copper mines at Mount Gabriel, Co.Cork indicates how the mining was done. There are heaps of broken stone and charcoal across the mouths of holes quarried into the areas of copper ores. They alternately lit fires against the ore bearing rock to expand it; and poured water over it to contract it and therefore shatter the rock.

In the quarry holes, on the tip heaps and scattered around the hill sides are round beach cobbles. Some have abraded edges which shows that they were used for pounding. Many are broken though some have remained intact. Some of them are grooved so that a handle could be fitted for easier use. The charcoal found has been dated to around 1400 B.C.

Bronze was discovered probably by chance. It is an alloy containing varying amounts of copper (eg. 90%) and tin (eg.10%). Tin was possibly mined in Wicklow or imported from Cornwall. Tin objects have not been found in excavations because tin is so easily oxidized.

There is little evidence here of smelting and workshop operations (particularly of copper). The first stage of metal production was the reduction of the ore (i.e. to copper oxide) which took place by roasting the ore in a kiln or furnace. The next step was the smelting which took place in a furnace or large pit in the ground. Alternate layers of charcoal and ore were subjected to great heat, aided by the use of primitve bellows. Smelting pots and crucibles were sometimes used. The copper or bronze was made into plates, blocks, bars or ingots for trade or subsequent manufacture. At Lough Gur, crucibles for smelting metals, moulds for casting, and stones for sharpening tools have been found.

The metal (molten) could be cast or hammered to make the implements. The open mould method was probably first used by making a depression in the sand, in which to pour the molten metal. Stones and clays with mould depressions in them for axes, daggers etc. evolved from this method and the moulds could be

used many times. Two and even three valve moulds have been found. It is thought that wax methods were used later in casting as some of the tools are hollow or have sockets (the latter belonging to the Late Bronze Age).

A late Bronze Age workshop has been found recently at Rathgall hill fort. The floor is cobbled and there is a large burnt area, probably the debris from the furnace. 400 waste fragments of clay moulds were found for casting swords. One fragment of a mould still had a broken blade in it which had been discarded because it had fused with the clay of the mould.

A hoard of later bronze age metal working tools were found at Poulaphuca, Co Kildare. The consisted of and differed little from earlier sets of tools. To find them in a group together suggests perhaps that the smith was a travelling man, taking his trade to where it was needed.

Soldering was known here in the Late Bronze Age but was only used in gold manufacture (which was mined and worked mainly in Wicklow). Gold was hammered not cast. The solder was an alloy made of silver, gold and copper.

Objects have been found with joins showing that welding was known (i.e.without a flux, hammering the two ends together under heat)

The later Bronze Age had a greater diversity and sophistication of implements, such as chisels, gouges, razors, flesh hooks, sickles and socketed spears and axes. Highly decorated axes (lozenges, rain pattern and chevrons) were a peculiarly Irish feature. Also domestic utensils such as large, round bottomed cauldrons with ring handles made of rivited sheets of bronze appear around 700B.C. Not all weapons and tools were made of bronze. Probably this metal would have been available only to the wealthy members of the community, the poor having to survive with stone tools only. They used finely polished stone hammers, axes or mace heads. They were made in numerous shapes and often decorated and mounted on wooden shafts. Flint and chert arrow heads of increased efficiency (they were barbed amd tanged) point to the existance of the bow. Yew wood specimens have been found in bogs and also complete arrows measuring 20" long. The heads were bound to the shaft by fine animal hair. Wrist guards of stone have been found too. Part of a wooden shield was found at Kilmahamogie, Co. Antrim.

Jewellery becomes more widespread as the Bronze Age progresses. Beads of stone, jet, faience and amber and also shells were probably made into necklaces, as groups of beads of similar type have been found together. Elaborate gold necklaces, bracelets, ear-rings etc. were made, some with the twisted torc effect . Many designs of bronze pins have been found. Dress fasteners have been found in quantity and they are peculiarly Irish.

Organic materials such as bone, wood, wool and leather played their normal role, though there is little evidence to be found of them. A late Bronze Age

hoard of objects were found in a bog wrapped in wooven woolen material. There were tasseled intricately wooven horse tail pieces , a sun flower pin, agouge and a razor in a leather case. This shows the sophistication of the Bronze Age, in the later years in particular. This rich time is known as the Dowris period (700-200 B.C.)and is characterized by shields, swords and trumpets. Few defensive weapons (except the halberd) have been found associated with the Early Bronze Age; life must have been more peaceful then, war fare only gaining in importance later on.

The Bronze Agers brought with them pottery beakers. They were thin walled and highly decorated geometrically. Sherds of the pottery have been found in debris, eg. at Newgrange, they dug pits at the base of the megalithic mound and F deposited beaker debris in them (2000-1725 B.C.). Lough Gur, Co. Limerick produced many pottery sherds from the refuse of the huts&c. Food vessels have been re-constructed from habitation sites such as Lough Gur but most pottery examples are found from grave mounds. They continued until about 1800 B.C. with the communal megalithic burial but they soon rejected it for the single burial.

The agrictural practices show a slow advance as the Bronze Age progresses. The saddle quern is still in use throughout,showing a reliance on grain. Grain impressions in pottery sherds have shown that barley, oats, wheat, flax and possibly rye was grown. Rathtinaun, Lough Gara is a late Bronze Age crannog which produced a valuable find of completely carbonized grain. It was found in the lake. It must have been over heated in the kiln and was therefore thrown out. The bulk of material was naked barley and small amounts of hulled barley and wheat. Other food plants were knot grass, goosefoot, blackberries, flax and lots of weeds.

H Sickles were found associated with the late Bronze Age, but not the earlier, and they are socketed, unlike the continental type. The sickles would have been used for cutting corn, and maybe reeds for thatching. Field system patterns have not been found in quantity from the early Bronze Age but the later fields are small and square. Digging sticks, primitive hoes and ploughs were used to prepare the soil by means of cross ploughing,forming square fields. The ploughs probably consisted of pointed oak rods acting as the plough share.

Bones,as always, supply good evidence of what meat was eaten. The early Bronze Newgrange site had the bone finds analysed by L. van Wiijngaarden-Bakker :

7

Animals:		Bone fragments:	Minimum no. of individuals:
cattle	domestic	57	37
pig	domestic	3I	30
sheep/goat	domestic	5	I2
horse	domestic	2	6
dog	domestic	4	I2
red deer - game		I	3

Hare, wild cat and goshawk bones were found.

At Ballinderry, Co. Offaly (a crannog site) a large number of red deer bones were found, but the usual high number of cattle bones, pig bones were absent, but there was a suprisingly high number of sheep or goat bones. Charcoal analysis of the site showed alder, ash, hazel and willow. The worked wood found was yew and hawthorn.

Not all the Bronze agers dwelt in substantial houses. Even in the later phase, some of them lived in sand dune sites, particularly on the North coast where pottery sherds have been found. Caves too have revealed evidence of Bronze Age habitation. Marsh hearths with beaker sherds found at Rockbarton near Lough Gur indicate seasonal habitation. Fulacht fiann (deer roasts) which are cooking places - often fairly temporary - have been found to date to the early Bronze Age. One wooden trough in Co. Cork dates to I650 B.C., and a copper axe was found which confirmed and tied in with the dating.

Joseph Raftery gives a good general description of the Early Bronze Age:

8

"It is possible to visualize acommunity living in rectangular or oval houses, with wicker work or stone walls and thatched roofs, presumably with accomadation for animals and grain. The local smith had his own special workshop within the community. Early Bronze Age man tilled the landeither by means of a digging stick, hoe or plough, and collected wild roots or berries to augment his diet. Stock raising as always in Ireland, played a large part in the rural economy, while leisure - and necessity - were ministered to by fowling, trapping and fishing. they were exceedingly skilled metal workers and metallurgical chemists."

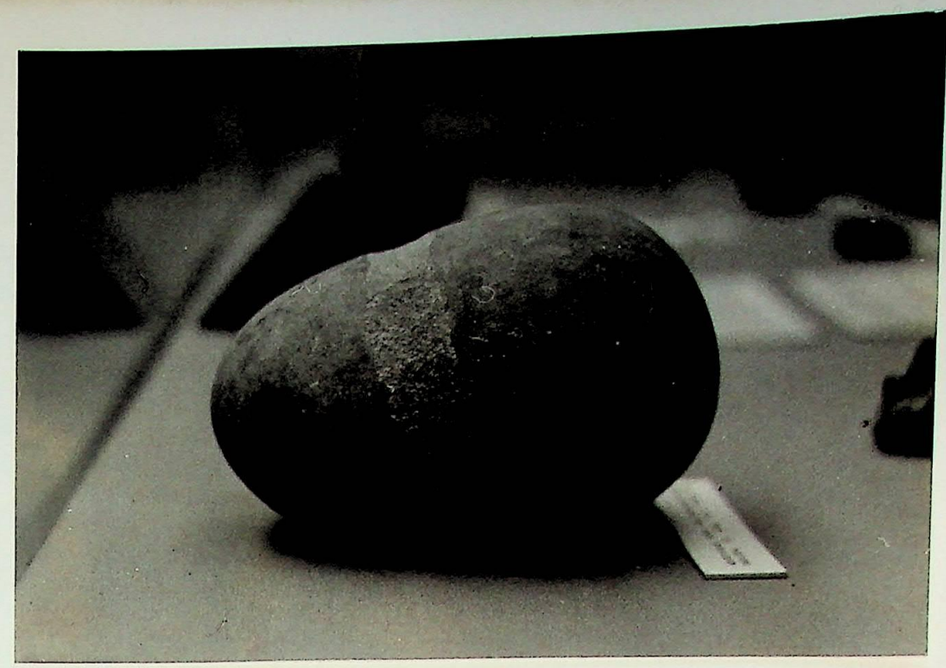
Of the Late Bronze Age, Raftery writes:

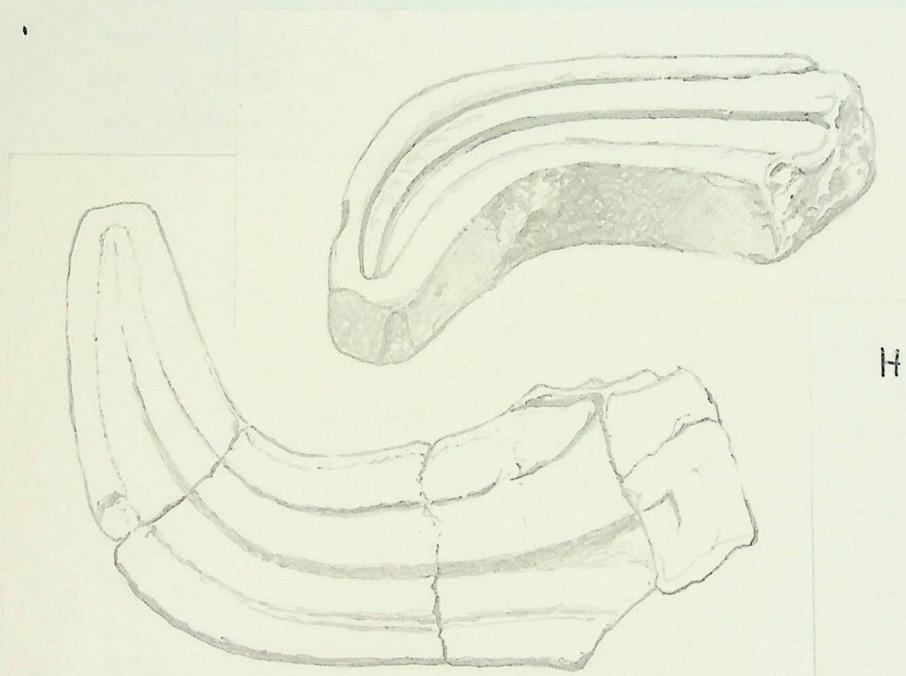
9

"They were in the main agriculturists and pastural farmers who tended their flocks (mainly of oxen) and their crops as do modern farmers: their fields are shown to have been small rectangular patches quite similar to those in certain parts of the country at the present day. Their houses were comfortable and of two types, rectangular and round. There is not much evidence of domestic metal working, and it seems that by this time the advanced conditions had given rise to a definite smith caste. The great increase in the number of 'founder hoards' discovered in Ireland indicates an independant itinerant class which employed not only newly refined metals but also any procurable scrap metal, such as broken swords etc."

G

Miner's maul stone.
Co. Cork.





H Mould for a sickle.
Kilmaddy. Co. Antrim
8th century B.C.

I

Selection of fragments of clay moulds from the late Bronze Age metal working area at Rathgall, Rath East, Co. Wicklow.
8th century B.C.

IRON AGE

Suprisingly little definite fact is known about the Iron Age. It is a difficult period to study as there have been comparitively few remains discovered. It is the "protohistoric link between the unlettered and written past". The earliest Iron Age influences probably reached Ireland around 500 B.C. but it was by no means a widespread immediate changeover. The Bronze Age culture continued unaffected and even when the Iron Age culture had established itself, many objects were made of bronze.

They had a predominantly pastoral economy with a strong social organization which clarified and accentuated itself as time continued. Towns were never formed, Ireland being primarily rural. The scattered dwellings were occupied by the local chieftains whose wealth was measured by cattle. They employed many peasants who now formed a large sector of the society. There were a variety of dwellings : a rath (ringfort) is a homestead surrounded by one to 3 banks and ditches. Sometimes the rath appears to be above ground level which is due to the accumulation of refuse and soil filling over the years. Raths are mainly farmsteads, not defensive. Hill forts and promontary forts were defensive structures, being built on a vantage point such as Caher-conree, on the Dingle Peninsula or Dun Aengus, Inis Mór Crannogs were also defensive, constructed on islands or in lakes, often artificially made, being constructed on clay, rocks, brushwood and rubbish. Where the earthen banks of a rath are replaced by stone (eg. in the west) they are known as cashels. A caher or dun is the name given to a particularly large and impressive cashel. The lis is the open space in a rath where houses, small farm buildings and livestock would have been kept. Many post holes have been found indicating rebuilding. This ties in with layers of charcoal found, possibly where the wooden buildings burnt down. This may be the result of the practice of burning buildings when they became very filthy, to form ashes and soot to be used as fertilizer on the land. But many of the poor people lived in clusters of clachans. Souterrains (underground passages) are often found in association with both raths and clachans and were probably used for refuge and storage. Many of the above celtic words occur in place names. Some raths and crannogs were lived in and used up till the I7 teenth century and in some areas until even later. It makes interpolation of archeological material difficult because more moderm methods of soil cultivation have disrupted and spread out much of the potentially informative refuse.

Much evidence has been found of iron working, particularly in the later Iron Age sites. There were two main sources of iron ore, one was nodules of iron stones and the second was bog iron. This is a brief outline of the iron

production process:

broken small lumps. → reduction by smelting in 800 furnace. → metallic state (iron spongy mass). iron slag deposited. → beaten to eradicate slags and to harden. → WROUGHT IRON

Implements were made by re-heating and hammering the iron.

K

Very few Iron Age sites have been found without slag debris, or fragments of crucibles, even in small raths such as Cush and Feerwore. Locations of furnaces are found because bits of hot debris from smelting falls into the bottom of the furnace, making a clearly defined area. At St. Gobnet's House, Ballyvourney, 57 furnace 'bottoms' were found, plus the fragments of 80 more.

The diversity and availability of iron tools and objects increases as the age progresses. Parts of iron bits and spurs indicate that horses were harnessed possibly from 100 B.C. onwards. At Aughinish rath, Co.Limerick, part of an iron horse bit was found in conjunction with a knob headed bronze pin which would indicate a fairly early Iron Age date. There is little evidence of carts or chariots but portions of roads and tracks of Iron age date have been found.

Heaps of field stones and walls have been found underneath turf bogs in Co. Antrim and Mayo, showing that stones were picked off the land so that ploughing could take place. First, ploughing was done with a simple ard. It is more economic to form the unwanted stones into walls. Other bits of refuse have been found in these stone piles, such as broken axes. These walls probably had a stabilizing effect on the cultivating societies.

Few agrictural tools such as bill hooks and sickles and ploughs have been found dating from before 300 A.D. but after this there was a dramatic increase in agriculture. Development of new tools made the destruction of woodland much easier. The coulter blade appeared, which cuts roots in front of the plough share. Cross ploughing was still necessary, as there was as yet no mechanism for turning over the sod.

Quern stones, both the saddle quern and the rotary quern (a new type) have beem found, and some of them decorated. Also evidence of grain drying kilns show that arable farming was widely practiced. But the huge quantity of cattle bones show that the pastoral existance was most widely practiced. A hill fort at Freestone Hill, Co. Kilkenny which is of late Iron Age date, produced a variety of bones. The cattle bones were predominant, followed by pig, then sheep bones. Dogs and horse bones were also found in small quantities. Bits of antlers ofred deer were found to be waste products from pick axe making. No quern stones, plough shares or any soil tilling equipment were found, which possibly supports the

view that hill forts were primarily defensive.

The diet can be seen in part from the bones found on sites. Beef was eaten in great quantity. Pig, mutton, and domestic fowl were also eaten. Fish were caught and eaten as well as wild fowl such as ducks, swans and geese. People living near the sea ate shell fish as can be seen by the Iron Age middens. Some raths further inland also show evidence of shellfish, such as the pits filled with sea shells at Aughinish. The grain grown was barley, oats, wheat, and rye and these would have been made into gruel or bread. Roots, herbs and berries probably supplemented the diet.

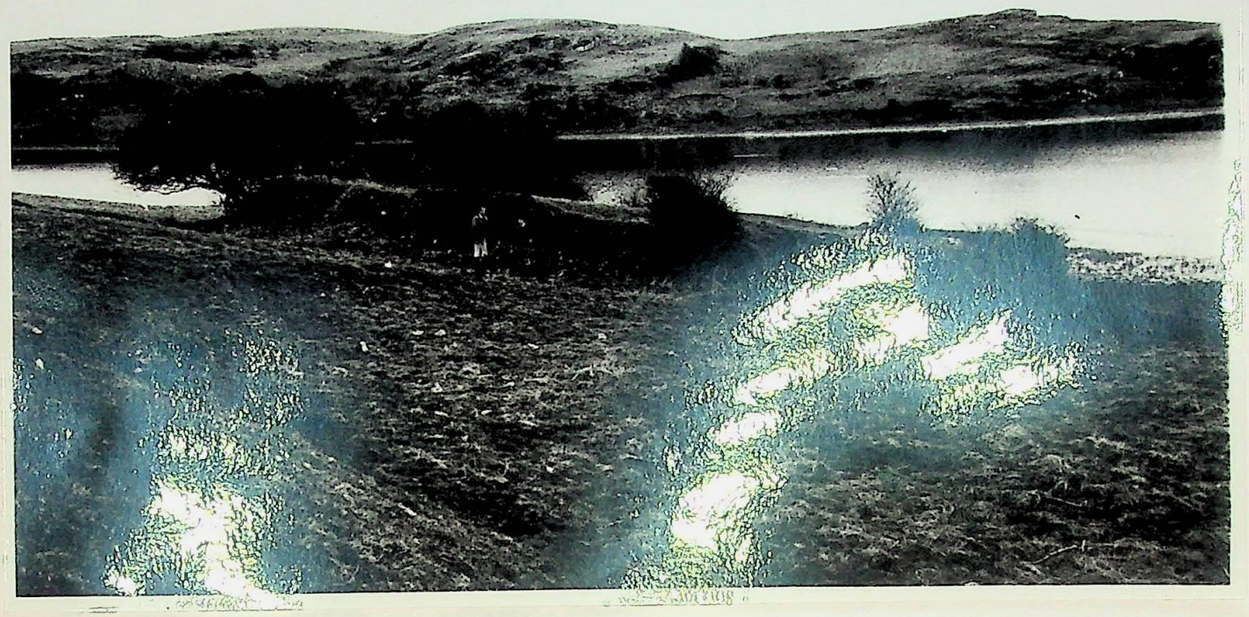
Domestic ware must have mostly been made of skin, and wood. Not much has survived as it is so perishible. Water and bog has preserved some; at Lagore crannog , parts of tubs and buckets made from oak staves have been found. Lathe turned bowls, mugs, scoops, boxes and plates have also been found in various stages of completeness.

Iron Age pottery is quite scarce in comparison with Bronze Age pottery. Only fragments remain in the refuse but the piecing together of these show bucket shaped pots of coarse gritty ware. At Aughinish rath, numerous fragments of this sort of ware was found , some in pits and some on the floors of single houses . At Freestone Hill, some interesting pottery of late Iron Age date of a different kind was found in association with a 4th century Roman coin. The pottery had a row of perforations under the rim. Very similar sherds were found at Rathgall hillfort and can be given a similar date because of the presence of a Roman strap tag.

Evidence of glass-making and enamelling has been found on a few sites. Jewellery and personal ornamentation was important. Pins, rings, torcs, brooches, bracelets, necklaces, beads etc. made of gold, sometimes bronze and other material such as jet, glass and enamel have been found in large quantities. Lough Crew, as well as other sites, has revealed trial pieces which are design samples made by craftsmen on wood, horn, bone and antler. They were transferred onto bronze, gold and bone if they were sucessful. So they were the equivalent to sketch books or rough paper.

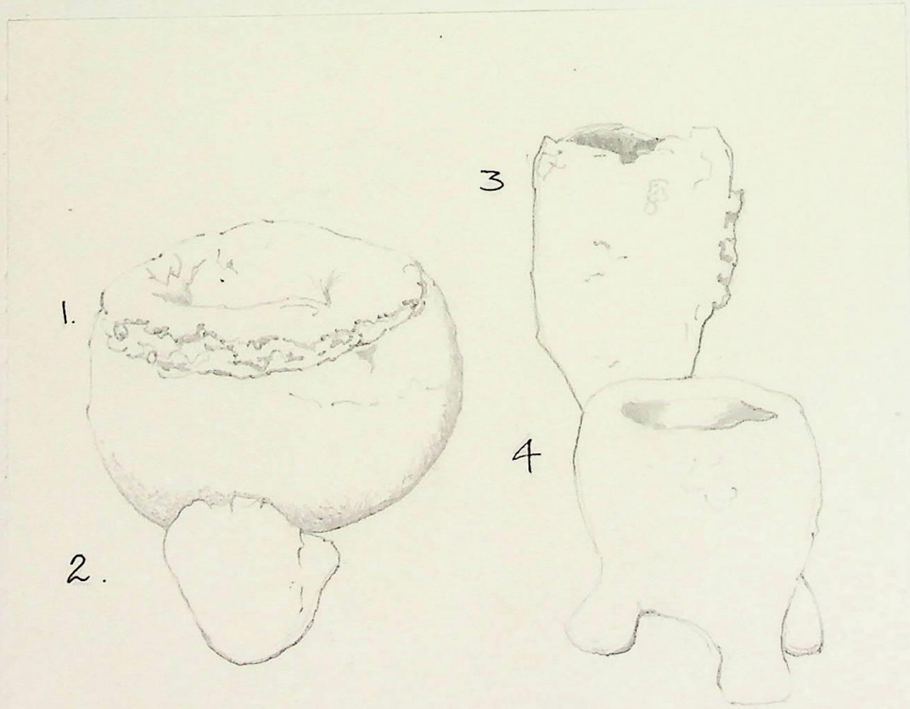
Very little has survived of the clothes worn by the Iron agers. From Lagore crannog, pieces of cloth showing the actual weave were found. Much is known about dressthrough the descriptions of heroes and other characters, in the myths and legends which were written about this period by later literate generations.

The orogin and chronologies of the Iron Age are not clear. Much more archeological excavation will have to take place before a complete factual picture can be built up of the society.



J

A raised rath at Lough Gur. Co. Limerick.



Early centuries A.D.

K Complete crucibles:

1. Stone crucible from Garranes, Co. Cork.
2. Small handled crucible from stone fort at Carraig aille, Lough Gur Co. Limerick.
3. Clay Crucible. From Lagore crannog, Co. Meath.
4. 3 legged crucible. Lagore crannog.

A crannog site. Lough Gur.
The crannog was originally surrounded by water but the marsh has since formed joining the island to the main land.

EARLY CHRISTIAN

Christianity first came to Ireland at the beginning of the 5th century from Gaul and West Britain. In fact, the celtic tradition was not greatly changed by Christianity. The religion took on a monastic role rather a diocesan one, with the development of important monasteries such as Tuam and Clonmacnoise. Perhaps the most spectacular one is Sellig Michael, stone buildings on an island in Dingle Bay. This was unusual as many of the early monasteries were built of timber or thatch. Most of our knowledge of this period is gained from early Irish literature. But excavations have shown for example that the diet of the monks was chiefly vegetarian as few animal remains have been found. They also ate fish.

The celtic society became even more stratified, with a hierarchy of kings and nobles. The craftsmen and lawyers and other learned men were on a social level with the nobles. Free farmers were quite well off but the tennant farmers had a rough existance. Lastly came the unfree section who were legally non-existant as they had no legal status.

Refuse found shows that little change took place until the Vikings invaded. But there were some innovations that made life easier. Parts of the mould board plough have been found dating to after 600 A.D. The wedge like action of the board turned over the sod. Plough pebbles have been found discarded in many Early Christian sites. They were studded into the bottom and land-side of the plough which was wooden, therefore the pebbles prevented undue wear. Many fall out and some are discarded because they have worn so much, they no longer fulfill their function. The pebbles normally show one flat or convex side with scratched parallel lines on them, produced by the abrasiveness of the soil. Four such pebbles were found at Killucan, Co. Westmeath where there is a 6th century site. At Goodland, Co. Antrim, the bog has concealed irregular piles of stones with early Christian pottery sherds, and near-by, there are patterns and marks from a mould-board plough. The stone walls were in effect refuse piles, as the easiest way to get rid of them was to build them into long rows which therefore both protect a space and provide a dump for the field stones. The fields had become long and thin by this stage as there was no need for cross ploughing. The origin of the furlong dates from this time; it was the longest distance the horse or ox could plough without needing a rest, as turning around was difficult and interrupted the continuity of ploughing.

The farming unit became more of a commune, and the common land was divided into strips. Higher up the slopes were the booleying areas. Isolated clachans can still be found on the hillsides where the animal tender lived during the summer.

Cahercommaun in Co. Clare is an 800 A.D. site, which gives a good example of a typical early Christian rath before the invasion of the Vikings. The lis

metres in diameter and is surrounded by 3 walls. Few weapons were found but there was evidence for iron working in the form of slag. Querns showed that tillage was practiced. The bone analysis is particularly informative. Over 95% of the bones belong to cattle of a small species . Pig, sheep, goat, horse and red deer were also in evidence. The shells of edible molluscs were found in plenty which shows that they must have brought them back from the coast which is about eleven miles away. Charcoal analysis showed that hazel, yew, ash, hawthorn, blackthorn, willow and elm were the predominant species, in that order. The absence of oak is worth noting. Little evidence was left of domestic structures and few pottery sherds were found. An interesting correlation has been made between an excavation yielding bones from the 8th century, and the laws and the records appearing in the annals:

Bones:	Excavation:	Laws:	Today:
Cattle	80%	33%	50%
Sheep	10%	33%	35%
Pig	10%	33%	15%

For simplicity the compilers of the records must thought it easiest to say that cattle, sheep and pigs were produced in equal quantities. The bones of both the cattle and sheep show them to be from animals of a smaller type.

The gaelic type settlements of the west continued unchanged for centuries, because few big Viking or Norman strong holds, except Limerick, were established there.

COPPER SLAG FROM MONASTERY, CO. WICKLOW

MEDIEVAL (800 - I500)

The term Medieval is a slightly misleading umbrella term covering from 800 - I500 A.D. inclusive. It includes the later part of the Early Christian period, the Vikings, the Anglo-Normans up to the beginning of Tudor times.

The Vikings were norsemen (northmen). There were two distinct groups, those of Danish descent who invaded England,and the Norwegian vikings who invaded Ireland. The Vikings eventually mingled with the indigenous population , though at first they offered resistance. But after being beaten at the Battle of Tara in 980 and then by Brian Boru at the Battle of Clontarf in IOI4, they became less war-like and more peaceful.

It was the Vikings who layed the foundations of our towns,such as Dublin, Wexford and Waterford. Previously Ireland was a country of isolated settlemants; ring forts, crannogs and monasteries.

The Vikings also invaded Normandy in France (northmen - norsemen - normonde) and became known as Normans. They then invaded England and later in about II00 the Anglo-Normans invaded Ireland. (These terms are specifically a language term) They mingled to a certain extent with the Vikings and irish population but unlike previous invaders, they kept everything they conquered and built large fortified castles (eg. Trim) as they gradually spread westwards.

Medieval Dublin (in particular, the much publisised and abused Wood Quay) is one of Ireland's most important sites. It is easier to take the area as Medieval in general as it is hard to differentiate between the inter-mingled Viking and Anglo- Norman cultures. Buildings were put up on top of previously decayed ones. Also both industrial and domestic refuse was built on top of by one generation and then the next:

12

> "This piling of layer upon layer meant that air was excluded from lower deposits, and this combined with the preservative actions caused by water logging on the site , has meant that many of even the most delicate objects have been almost miraculously preserved whereas in other conditions they would long since have disintegr-ted".

House constructions, transport networks, and sea defences were therefore included in the refuse, so it is possible to construct maps, though it is difficult as the layout was constantly changing. Vast areas of wickerwork were used as partitions,screens, boundary fences, matting and pathways. The wattle work fences were made of hazel, ash or elm. Broken up ship's timbers were used in the early I3th century as part of the old waterfront.

There was a steady accumulation of refuse with little means of getting rid of it . Pigs(whose bones have been extensively found in pits) were allowed to scavenge in the streets. In the I3th century the Provest of Dublin writes of the condition of the city:

13 "......not to suffer any cattle to be slaughtered within your walls, neither to suffer any swine to run about the streets and to banish all beggers in times of sickness and plague."

Later in I489 the condition of Dublin is described in a letter from the Earl of Kildare:

14 "The king has been informed that dung heaps, hogsties and other nuisances in the streets, lanes and suburbs of Dublin, infect the air and produce mortality, fevers and pestilance throughout the city.... ..the king commands the mayor and bailiffs to cause forthwith the removal of all swine and to have the streets and land freed from ordure, so as to prevent loss of life from pestilential exhalations."

Cats(of a very small variety) and dogs, mostly of terrier type, were present as shown by the bones. They too probably scavenged and kept down vermin at the same time. Kites were a feature of Medieval Dublin, living off carrion.

In the IOth century most of the post and wattle houses had associated pits either inside or nearby them. Therefore some effort seems to have been made to cope with the refuse problem. Their original function was probably not for refuse but perhaps for tanning. Over I00 were found in the High Street area and 60 in Winetavern St. They were mostly circular holes but a few had sides of wicker to stabilize them and some were much larger and the sides were re-inforced with boards, eg. in I2th and I3th century Winetavern St.

The refuse thrown into pits has given an excellent supply of information about the domestic and to some extent the industrial life of the people. Food and the diet has been particularly well preserved. Pig bones (mentioned above) have been found the most frequently, forming a main part of the diet. Beef too was eaten in quantity and mutton to a lesser extent. Hares were popular. Rabbit bones have been found in later Medieval refuse. (Rabbits were first introduced into the country by the Anglo- Normans.) Poultry was kept , geese were trapped (both greylag and white fronted). Fish, as expected, were caught. Shell fish such as oyster, cockles and mussels were commonly eaten as the shells are found in great quantity.

Cesspits and drains such as the IIth century wooden conduit discovered at High St., have had the material inside them analysed. They produced seeds of strawberries, blackberries, rowan berries, apples, sloes, plums and hazel nuts. Figs were obviously a delicacy as evidence of them rarely appears. Knot grass and goose grass seeds were also found, which tie in with the organic contents found from what was the stomach of a burried individual of the same period. A porridge like mixture or bread must have been made of the seeds after they had been ground. Another pit revealed similar seeds and pips with the addition of cherries and grapes which must have been imported. The remains of a male flea was also found.

Various types of fabrics have been preserved. Awide range from coarse heavy materials, to light twills and nettings have been found. Unfortunately no garments have been found complete, only fragments and scraps of them. Weaving tablets, needles and shears found, indicate a high standard of tailoring.

An excellent record of foot wear of the period has been gained from the refuse piles from cobbler's leather workshops. An area I8m. by 6m. and Im. thick, in I3th century High St. consisted of clippings and portions of shoes and scrap leather, including about I000worn out soles of shoes. It seems that maybe the soles were not repaired, but new ones were sown onto the original uppers. Information regarding the size of feet can be gained. Various types of boots, shoes and slippers were made for both adults and children as well as a range of other leather objects.

Refuse heaps from I2th century comb making workshops at Christchurch Place are interesting. Pieces of antler bases were left as waste . It is particularly strange because there are no bones of red deer in the food refuse, so antlers must have been specially looked for to use for making combs. Broken combs were also discarded, some of which have intricate designs carved on the antler.

Trial pieces, which are antler, bone or horn with designs at various stages of completion (equivalent to an artists sketch pad) have been found in pits. Some of them are beautiful pieces of design work.

The house furnishings must have been fairly sparse. Very little remains of furniture has survived. Perhaps this is because furniture was burnt when it became to old or rickety to be servicable as most of it was wooden. A very low 4 legged stool (though only 2 legs are preserved) has survived. Smaller pieces of decorated wooden domestic ware are more commonly found, such as wooden spoons, tankards etc. The blade of a wooden spade was found from I3th century High St. But not all the domestic ware was wooden. Stone mortars for grinding meats and poultry to pulp and also herbs and spices were found in the debris. Some domestic articles were made of metals and others of pottery.

There is much evidence of metal workshops in Medieval Dublin, in the forn of crucibles, moulds, slag, etc. The diversity of objects is very wide; weapons, spurs, strike-a-lights, complicated padlocks with keys, hooks for fishing etc.

Thousands of pieces of pottery have been found. Many are of foreign origins eg. Spanish, French, English or German. It is possible to piece some fragments together and the range of objects is found to be wide. Pottery roof tiles and chimney pots were used in some cases as roofing materials, being more durable than thatch, wood or shingles which were used by the poorer people. Slate was

sometimes used. Pottery oil lamp fragments have been found. Before candles were commonly used, a wick was placed in oil or animal fat. Charred pottery may indicate ware that was placed over a fire as well as crucibles used in metal work. Ornamental pottery such as elaborate puzzle mugs were among the luxurious items. Glass is seldom found, though a glass stem (?) was found in Winetavern St. thought have been imported in the late I5th century.

The original ditch of Trim castle dug in II72 became infilled and the soil contained much refuse, including about 20,000fragments of late I3th century pottery.

Personal ornament played quite a large part in the life of the people of Medieval Dublin. Awide range of brooches, bracelets and rings have been found. Many dress pins have come to light as they were a means of fastening clothes. Chippings and pieces of amber have been found in pits indicating that amber was used for jewellery and was made in workshops in Dublin. Whole amber beads have also been found.

Many gaming pieces, toys and other indications of leisure time pursuits have been found. Dice, though there civil and legal prohibitions against them, were played. Gaming pieces of bone and wood such as chessmen, have been found hidden among the debris. Slate gaming boards (of 9 men morris?) as well as wooden ones have appeared. An elaborate IOth century yew wood gaming board was found in a crannog in Westmeath. Children's toys are in evidence such as wooden spinning tops and part of a French ceramic trumpet. Wooden flutes too show some regard for music but no indication of more sophisticated Medieval instruments have come to light. Skates, perhaps more of a practical consideration, were found which casts an interesting reflection on the climate which must have been colder to make the possesion of skates worth while. But maybe they were brought over with the Vikings who had the knowledge of skates from their original colder Norwegian climate.

Wooden tally sticks with notches cut in them were possibly used by shop keepers for records of payments due. Small weighing scales perhaps indicate precision in trade dealings. One particularly interesting find in one of the refuse pits was a collection of pewter tokens possibly thrown out because they were illegal(?)

Most of the above examples are from Viking and Norman Dublin, simply because most material is from this area. But rural Ireland was a different set up. By II00 the feudal system was beginning and two societies existed. One was the Anglo-Norman feudal society which colonized the areas with good soils. Cdonies grew up around Norman castles eg. Mallow.

"There has been fighting in all provinces, endless campaigns, cattle

raids, burning attrocities - Ireland lies like a trembling sod."
This was written by a welshman, Giraldus Cambrensis who travelled in Ireland in II85. He was referring in particular to the increased violence of the strengthened campaigns after II69. In I299 there were 38 castles in Co.Cork alone. Landlords became powerful and rented out land which was the beginning of the tennant system. But still there were some self sufficient farmers forming the second type of society; a non feudal gaelic one. They lived in raths and crannogs similar to the Iron agers.

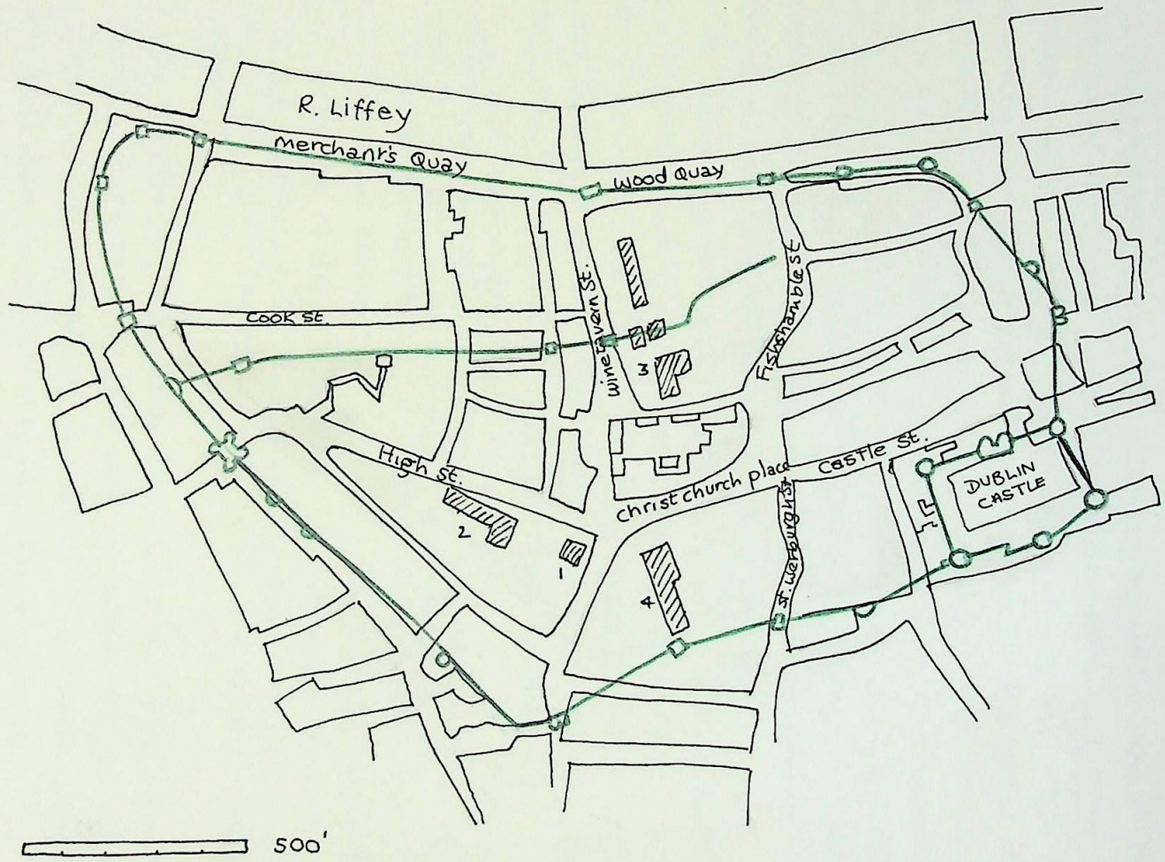
At Lough Gur there is an example of a typical cashel with evidence of house remains both inside and out. A hoard of IOth century Viking silver was found there. The bone analysis is interesting to compare with the town bone refuse. Over 90% of the bones were cattle, with bones of sheep, pig and a few of horse, red deer, dogs, cats and domestic fowl. Fish bones as well as bones of ducks, geese and swans were found. Rotary querns and carbonized flax seeds were found. Evidence of iron and bronze working was discovered. This shows that a community very similar to the Iron Age existed parallel to the technologically more advanced Viking and later the Anglo-Normans.

Knowth too was occupied at least until II00 because two Anglo-Saxon pennies were found. Bones of ox, horse, pig and sheep were found. Stones from rotary querns and iron slag were in evidence. Am interesting correlation occurs between these finds and the records in the annals which tell of the Vikings attacking and plundering the area in 860 and 934 A.D.

A new wave of monasteries came with the Anglo-Normans. Melifont Abbey which was a cistercian monastery was consecrated in II57. There was a strong agricultural emphasis as well as metal working, as there was elsewhere in the country. Farming methods were still fairly primitive. One eared spades or loys have been found. They were used more as foot ploughs for making ridges than for digging. A toothed sickle was used for harvesting and for the threshing of grain, a stick or a flail was used. Remains of kilns, mills, sheep folds, calf pens and pig sties show that the Medieval strong farmer was relatively well off in comparison with the small farmer who probably had to pay huge rents to the Lord of the manor and probably only had part shares in ploughs and other conveniences such as mills etc.

A Medieval site in Waterford is to be excavated in the summer (I979) and it will be interesting to compare it with Wood Quay & Medieval Dublin.

MEDIEVAL DUBLIN : showing gates, towers & town walls.



N.M.I. Excavations (1962-3 ; 1967-74)

1 & 2 High St.
3 Winetavern St - Wood Quay
4. Christchurch Place

TUDOR STUART & GEORGIAN (I500 - I800)

The beginning of the I6th century marks the end of the Medieval period. The first of the Tudors, Henry VIIth came to the thrown in I50I. Claxton invented the printing press which meant that literature could be spread and publisized much more widely. It was also the beginning of the Renaisance, and its effects spread to Ireland particularly through trade.

On a more national level life in Ireland radically changed (though it took some time) under the Tudors. At the beginning , the country escaped subjugation being until then,under the hand of the comparitevely mild Anglo-Normans, but by the end of the I7th century Ireland was definitely of colonial status. (The first Stuart king was James I who came to the throne in I603). The Anglo- Normans brought in the feudal system but it only covered the most accessible areas of good soils such as the east coast. The Tudors were the first for instance to open up on a large scale, the still wooded valleys of Munster. English people were granted large tracts of land . Spencer the poet for example, was granted an estate by Queen Elizabeth I of 3028 acres at Kilcolman, near Buttevant Co. Cork. This was in I586. The plantation was taking place on a large scale. From the English point of view, it was the most sucessful in Ulster. Cromwell came later and left a trail of destruction behind him. Croften Croker quotes part of a poem refering to the castelated houses of the late I5th century and I6th century. The poet describes Kilmallock, Co. Limerick after it was destroyed by Cromwell:

16

> "____most fayre, that long a building was,
> Where now, God wot, there growes nothing but grasse,
> The stones lye waste, the walles seeme but a shell
> Of little worth, where once a prince might dwell. "

Cromwell also ruined abbeys and fortresses. A publisher once asked who he should dedicate his prints of Irish buildings to. The answer was:

17

> "If your dedication is promted by gratitude , I know of no-one deserving it more than Oliver Cromwell, whose cannon has made so many dilapidated buildings for you."

Efforts were made to keep towns clean in Tudor times. The farmers were the main cleansers of the towns as they used the manure for the land. They had composting down to a fine art. Manure was described as "almost anything that hath liquidnesse, foulnesse, saltnesse or good moisture in it."

18

19

> The condition of houses can be seen from the "rush floored halls of Tudor England with trodden earth and dogs and debris, were no cleaner than the bottom of a paleolithic cave". where stale rushes and bones mingled with decaying food

The filth was dug out when it reached a depth of 2 - 3 feet but instead of being used on the fields, it was taken to caves (or other places of refuge) where it was mixed with urine, blood, wood and ash and made into gun powder.

The halls as described above were quite a rarity in Ireland. Only a few of

the Lords had such large houses as most of the Irish population were poor. In the I700's some big houses were built as it was 'safe' to emerge from the fortified castle. A transalation of an irish manuscript reads as follows:

20

"Castles high fall in decay,
And the lords that came did hold them;
Lords and castles pass away
As our beads when we have told them."

There are no houses of I5th or I6th century date in Dublin. Sadly the last one was demolished in I8I3. It was a late Medieval type half timbered house, a typical commercial dwelling. The shop was at street level with the living quarters at the back and upper floors. The upper floors projected so they jutted out over the street. It stood on the corner of Werbburgh St. and Castle St.

Many of the Irish following the traditionally celtic way of life, had mostly retreated to the hills and bogs where their pastoral existance continued largely undisturbed. Many travellers came to Ireland and wrote (usually not very kindly) about what they saw. But Dr. William Petty, an englishman wrote in the late I600s trying to explain the apathy of the Irish:

21

"Their lazing seems to me to proceed rather from want of employment and encouragement to work than from natural abundance of phlegm in the bowels and blood, for what need they work, who can content themselves with potatoes, whereof the labour of one man can feed forty; and with milk, whereof one cow will in summer time give meat and drink enough for three men; when they can everywhere gather cockles, oysters, crabs with boats, nets, angles or the art of fishing, and can build a house in three days ? And why should they desire to fare better though with more labour, when they are tought that this way of living is more like the patriachs of old and the saints of later times by whose prayer and merits they are to be relieved and whose examples they are thereof to follow? And why should they need more cattle since tis penal to import them from England? Why should they raise more commodities, since there are not merchants sufficiently stocked to take them off them nor provided with more pleasing foreign commodities, to give in exchange for them? And why should men endevour to get estates where the legislative powers is not agreed upon; and where tricks and words destroy natural rights and property? "

The potato was at the beginning of the I600s starting to gain great importance in the Irish economy which was to lead up to the terrible crisis of the famine.

Many of the landlords were absent much of the time. Others had little that they were prepared to spend on their Irish estates and they took all they could from the tennant farmers and serfs. By the end of the I700s the middle man had died out but previously he raked off any profit that would have gone to the tennant farmer. Mitchell quotes a traveller describing disorganized conditions:

22

"Enclosures are very rare amongst them, and then no better fenced than an old wife's toothless gums.....as for the arable land it is almost as much neglected and unmanured [unworked] as the sandy deserts of Arabia."

Excavation has located farm machinary such as ploughs of different types. Travellers write of 'poughing by the tail' where the plough was literally fixed

directly to the horses tail. A. Young describes some ploughing in Cavan:

23 "Here let it be remarked, that they very commonly plough and harrow with their horses DRAWING BY THE TAIL. It is done every season. Nothing can put them beside this, and they insist that take a horse tired in traces and put him to work by the tail, he will draw better, quite fresh again."

The spade which can be found in odd ditches and corners of haggarda was the main cultivating implement up till the end of the I9th century and is still used today in places with very stony ground. They were not so much used as a digging instrument but as a method of turning the sod. The variety and specialization of the spade from different areas, dictated by the soil type, is impressive. Flachters or breast ploughs can also occasionally be found, their function was
24 to make ridges. "Under the traditional system ploughing was merely marking the land with furrows."

Hay was made and cut with a scythe, the long handled variety was called a sned which was the most popular. Corn was cut with a sickle or a hook, either toothed or smooth. The flail was used for the extraction of the grain from the
25 heads. This was not always the case as "the unprofitable custom of burning corn in the straw" was prohibited in I635, and doubtless it did not stop immediatly. The beesom of heather was used to clean the floor for thrashing to take place. Remains of corn drying kilns are in evidence which were used to harden grain before grinding. They are stone lined and vary from region to region.

In the south an interesting practice was recorded by Dr. Madden in I738 , that of putting the waste from thatch rooves and sometimes complete houses into soot
26 houses. "Cottar houses of dirt, sticks and straw were generally removed once a year." These were smouldered to produce ashes and soot as fertilizer. Similar
27 practices took place in Sutherland and the reason "was said to be that the accumulation of filth had rendered the place uninhabitable"

The economy was by no means concentrated on arable, it was in fact largely pastoral.

Bones found amongst refuse and infill in I6th century ditches at Newgrange produce an interesting result. Sheep bones provided one third of all the bones found, whereas in Medieval times and before, they would only have comprised one twentieth (approx). But perhaps the farmer in question was primarily a sheep dealer. Other bones found were cattle, pig , hen, rabbit and deer.

In Georgian times in the towns, waste proves a valuable source of information. There was a large rift between the rich and the poor. Refuse examined has revealed bones of animals: beef, mutton, pork and rabbit. Fish waste and bird bones form a significant proportion of rubbish. Broken bottles and china were thrown out exclusively by the upper classes. The poor were still using leather

and wood. Many fragments of pots, pans and domestic furniture, as well as complete specimins have been found. The interesting thing is that many of them have three legs, so that they will balance better on rough ground. Paper and cardboard were very scarse. Much ash and cinder were thrown out. There was such a volume of refuse that it had the effect of raising the level of streets significantly, therefore the ground floors of many Georgian and Queen Anne houses became basements, or several feet below street level. Examples of this in Dublin are areas such as Merrion Square or St. Stephens Green. The Green was laid out in I665.

J. C. Wylie humourously quotes:

28 "The fop of the I8th century with his red heeled shoes had to tread even more delicately than his counterpart of earlier ages when he contemplated the wretch in pillory being pelted with dead cats and turnips."

Dean Swift was very concerned about conditions of squalor and poverty and makes this observation about a flood:

29 "sweepings from butchers stalls, dung, blood, drowned puppies,stinking sprats, all drenched in mud, dead dogs and turnip tops come tumbling down the flood"

Waste from industries is often found. It ties in with literature on the subject. Many glass works were set up in the mid I700s. Some advertized goods available from glassworks are useful in deducing what the various functions of certain glass objects foundin dumps were. In I749 Rupert Barber of Lazar's Hill Glass works issued this public notice:

30 ".....new glass house at the lower end of Lazar's Hill, where they may be supplied with the following goods: wide mouth quart or pint gooseberry bottles suitable for pickles etc. gardevins of any size, pint, quart bottle or gallon rounds for druggists, distillers, round or square cannister bottles for snuff or flowers of mustard, small garden bell glasses; taverns and public houses supplied with quart, pint and half pint secanters for wine, cider or ale. All the above goods of bright green glass, better of their kind there cannot be."

One easily accessible dump of an old glass works is at Ringsend*. There is much melted, useless glass and many bottles including mallformed stoppers etc. In Munster, glass houses also grew up. In I784 Thomas Burnett and GlassHouse Co. was started in Hanover St. The glass houses and iron furnaces between them did much to reduce the woodlands further. The oak staves were also used for barrels, ship's timbers and houses.

Little excavation of sites of I6th - I8th century date has been done , only when it overlies earlier remains. In some countries such as Denmark, I6th century and later archaeology is becoming important in its own right.

* Ringsend - the dump has since been levelled to make a pitch and stadium.

VICTORIAN

The Industrial Revolution changed the BritishIsles radically, although Ireland was not so much affected, except the larger centres such as Belfast and Dublin. It had a disasterous effect on the sanitary arrangements. Vast areas of factory chimneys, slag heaps, ases, scrap iron refuse , rubbish and chronic slums became the order of the day.

Conditions were dreadful. Women and children worked in factories, pulling trucks up to their knees in filth, the children working 10 hours a day. People were crowded in attics and cellars. 10 families and 10 lodgers often lived in 10 roomed houses. In 1839, Drs. Smith, Arnold and Kay reported the following to the home secretary (in England):

31 "The masses of the population were crowded in courts and alleys and narrow streets almost insusceptible of ventilation: in dwellings which themselves were not fit to be inhabited by human beings: while all around the dwellings, the utter absences of drainage, the omission of scavenging and nuisance prevention: the insufficiency of water supply, conduced to such accumulations of animal and vegetable refuse.and to such pondings of odourous liquids as made one universal atmosphere of filth and stink."

John Phillips, engineer to the Metropilitan Committee (U.K.) said in 1847:

32 "There 100's, I may say 1000's of houses in the metropolis which have no drainage whatever, and the greater part of them have stinking overflowing cesspools. And there are also 1000's of streets, courts and alleys that have no sewers, and how the drainage and filth are cleared away, and how the miserable inhabitants live in such places, it is hard to tell.....Where filth was lying scattered around the rooms, vaults, cellars, areas, and yards, so thick and so deep that it was hardly possible to move for it . The effect of the effluvia, stench and poisonous gasses constantly evolving from these foul accumulations were apparent in the haggard, wan and swarthy countenances and enfeebled limbs of the poor whom I found residing over and amongst these dens of pollution and wretchedness."

It was the city custom to empty all the refuse into the streets and waterways, and as the Public Health Act of 1875 puts it: "empty all the household slops into the street at night with the warning cry of Garday-Loo" (gardez l'eau). In Edinburgh the shout of Garday-Loo was heard when the tenement window was opened to throw out the refuse, and the responding cry from below was: "haud yer haun". The custom of the man always walking on the outside when with a woman originated from these unhygienic times as the windows slightly overhung the streets and the man on the outside would be more likely to receive any stray slop.

In Dublin in 1805, the Lord Mayor issued a proclamation that in order to protect the people from diseases incidental to filth, he would indemnify them for removing it and it is reported that one gentleman "in consequence of the notification cleansed seven perches (about 40 yards) of street about his house, and in doing so removed 150 loads of gutter".

33

In September 1856 The Economist reports:

34

> "Amongst the matters recently referred to by the registrar-general as affecting the health of the metropolis are the cleansing of the streets now covered with horse dung. The subject has two distinct aspects, the material and the moral, or what should be done with the refuse matter we must get rid of, or perish and who should do it".

There were few people in the 19th century who were seriously trying to do anything about the refuse problem. Chadwick (1800-1894) devoted his life to the "sanitary idea" producing his famous report of 1842. For nearly a century the theories and efforts of Chadwick and his friend and aide, Alderman Machi, were dismissed as impractical "closet philosophy". They were known as the "sanitarian confraternity" or the "closet philosophers". However, Chadwick was recognised for his work eventually as he was knighted for his efforts a year before he died.

The above is mostly a description of the unhygienic conditions and not what we can learn about the Victorians from their refuse. When we come to such a comparatively recent time in history, there are so many other sources of information as to how the people lived, that the study of refuse is not likely to uncover many secrets in the way that the contents of a mesolithic dump would. But on a basic social-history level it is interesting, especially when compared with the contents of modern rubbish.

Less perhaps is known about life in rural Ireland. We know plenty about the life of the people in large country houses but not so much about the poor farmers and labourers.

Discarded tools, cooking utensils etc. can tell us much about the farming practices and domestic life. In remote parts of the West some old methods of farming etc. are still used but most are becoming obsolete. Books have been written by people travelling in Ireland in the 19th century referring to the squalor, dirt, rubbish etc. that the poor lived in. E. Evans quotes the words of a traveller during the famine years:

35

> "The villages in which the greater portion of the people (of Western Ireland) reside.....consist of a collection of hovels.....grouped without regularity, formed of clay, or loose stone with green sods stuffed into the interstices".

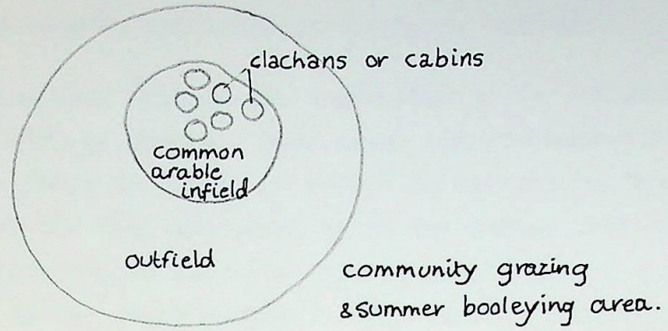
On Crofton Croker's tour of Ireland in 1822 he describes the Kilmallock, Co. Limerick, area:

36

> "Whenever a hovel is required to be built, the materials are procured by breaking down part of these once splendid mansions, some of which have been lowered and fitted up in accordance with the neglect and desertion of the place, and the interior if it there is occupied by sheds for cattle, or more loathesome pigsties".

Life was very much on a subsistence level, and so little evidence remains except the discarded and now obsolete farm implements. Methods continued much as they had done in the previous century except for minor changes, for example by the middle of the century the scythe had begun to be used instead of the sickle

for harvesting. In the remote areas the Rundale system was still in operation.



Life was still very largely dependant on the potato, which precipitated the rural crisis culminating in the potato famine of 1845 -1849. The potato allowed for a massive expansion of population. The standard of living deteriorated more and more , particularly for the landless labourers. The essentials for life were a roof for a cabin, a fuel supply (all available wood was slashed and pilfered), straw to lie on, and a spade. Evidence of the spade can still be found. Rusty remains are often turned up by modern ploughs or are found lying at the back of farm sheds, haggards etc. In some places they are still used. The Irish loy was still in use. At the beginning of the 19th century the two-eared Irish spade makes an appearance. Unlike the English spade there are two foot-plates on either side to protect the feet because many people wore no shoes. Potatoes were planted in lazy-beds, which was the most effective way to till the soil. The tenant farmers were often little better off than the labourers but in addition they probably had a few pigs, ("the gentleman that pays the rent"), and a cow. A horse might have been shared with a neighbouring temant. Often rotting horse-collars, traces etc. made of iron or leather can be found in barns and farm buildings with the remains of carts and drays. Rick-stands,which were specially shaped and worked stones to prop the hay- and straw-stacks on, are found lying disused in corners of yards.

The Industrial Revolution had very little effect on Ireland. Mining was the most important of the industries . Mining waste, derelict engine houses, old shafts and ruined miners cottages can still be seen in places such as Glendalough in County Wicklow where lead was mined. In West Cork at Allihies ugly slag heaps testify to the importance of copper-working there. Perhaps the greatest effect on the countryside was the result of the lime-workings, with lime being used for agriculture and other purposes. Likewise, sand and gravel pits have left piles of refuse and holes in the landscape.

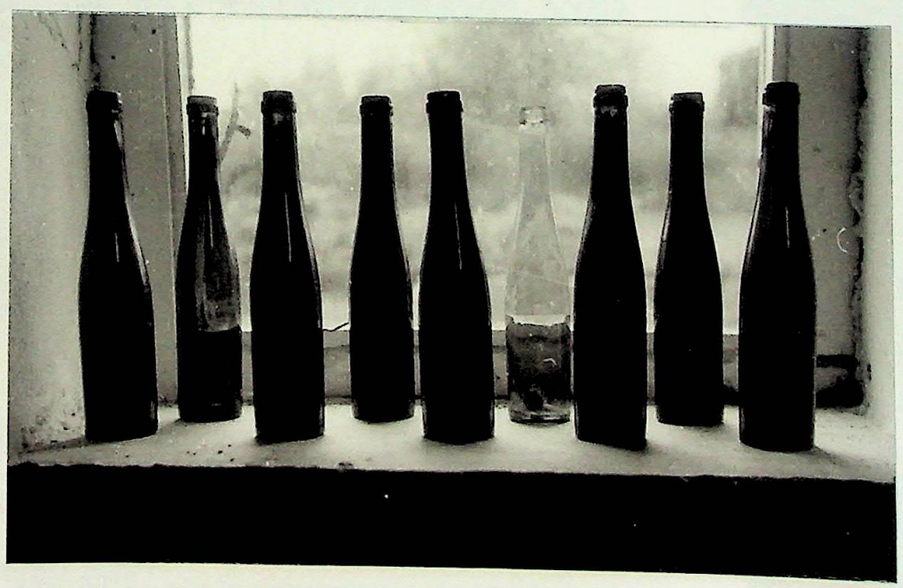
After the famine the country was left with a depleted population, and the countryside was left barren, infertile and treeless. There are many stone huts

and dwellings derelict in the West, but little remains of the more temporary cabins in the un-stony areas. After the famine an effort was made to restore and reclaim the soil. The countryside was opened up with improvements in communication such as canals, roads and particularly railways.

The refuse remains show that on the whole, life in the Victorian era was good for only a minority of people. From large country houses and fashionable areas of the cities, there is plenty of refuse to testify to the affluence of the inhabitants. But the type and quantity of the refuse from the slum areas of the cities, and from around the stone huts and cottages of the labourers and tennant farmers in the country, show the squalid conditions and lack of refinements that they had to endure.

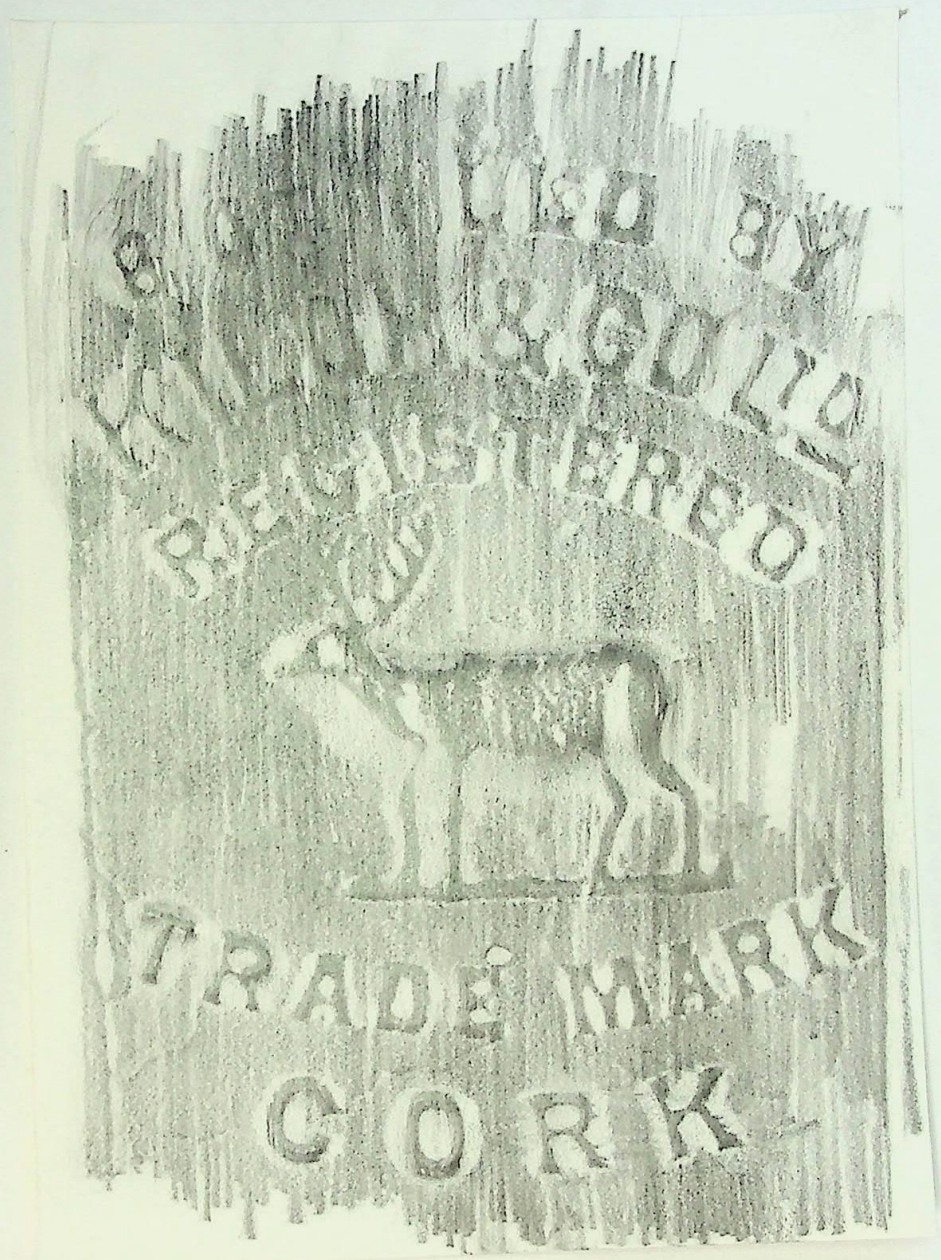
N

Discarded stone ride stands can be seen in the foreground with other disused farm objects lying derelict behind.



O

Late Victorian hand made wine (hock) bottles.



Rubbing of the embossing on bottles 586

p.

1. Beer bottle (green) with mould made body & hand finished neck & 'bullet' stopper

2. Dark green (medicine?) bottle hand made

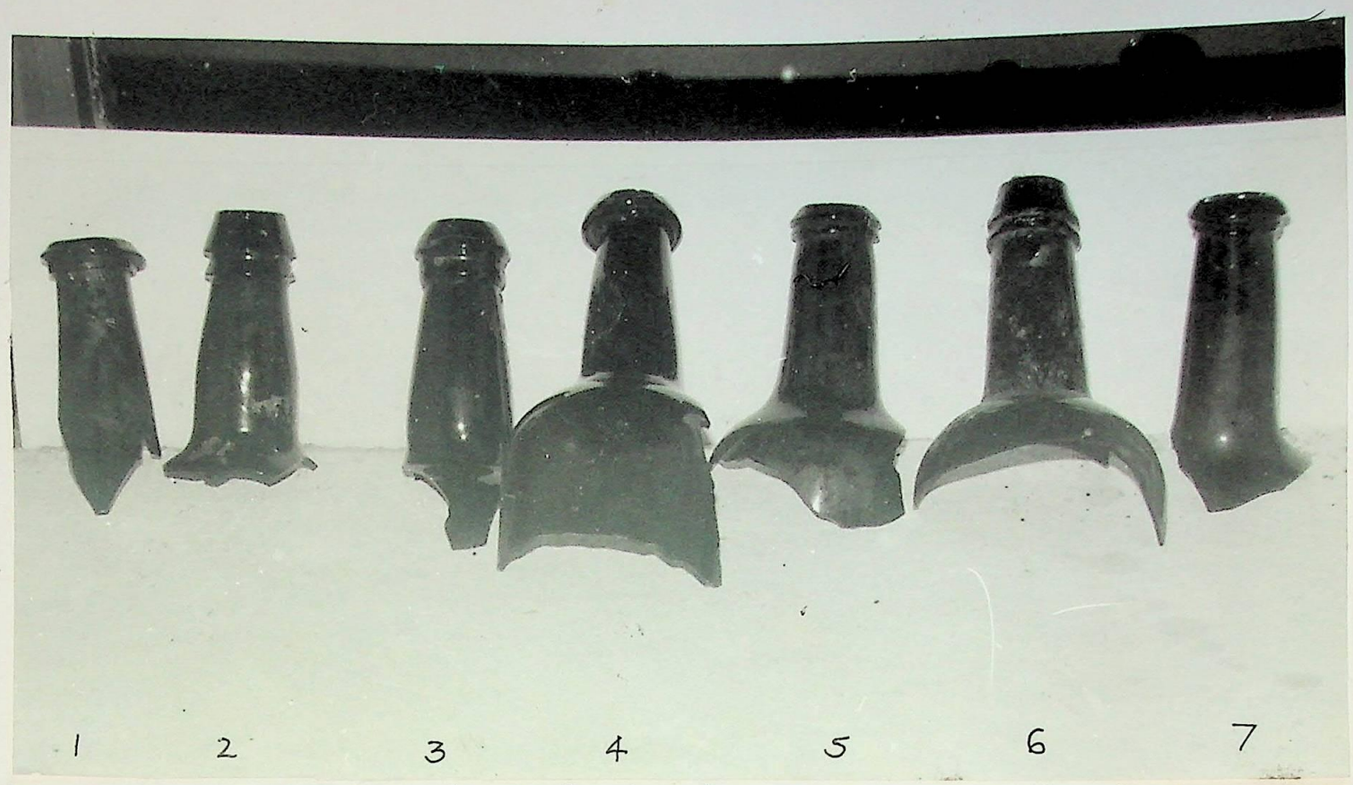
3. mould made Cades beer bottle with 'bullet' stopper. (dark green)

4. Thwaites mineral water bottle with 'bullet' stopper. (pale green)

5&6. Two beer bottles (v. dark green) of the same brand but out of different moulds

7. Eiffel tower Lemonade. (souvenir) (pale green)

8. Hand blown beer bottle (light green) with bullet stopper.



Q A variety of types of hand finished bottles necks ranging in date from ≏ 1773 (no 1) ≏ 1800 (no .5 & 7) ≏ 1825 (no. 2 & 3) ≏ 1850 (no. 6)

R Early Victorian wine bottles. Bottles no 1 & 2 have 'H. Ricketts & Co. Glassworks. Bristol' embossed on them. Some of the bottles have a very pronounced 'pontil' mark where the bottles were connected to the glass blowing rod.

EDWARDIAN until the PRESENT

At the turn of the century, times improved (in comparison with the previous century) therefore the volume of rubbish increased and the character of it changed in accordance with the changing habits both domestic and industrial.

Since then, major influences such as the war years between 1939 - 1945 meant that there was much less wastage because of universal rationing. But conditions really began to change within the last 30 years.

In any rubbish dump from the turn of the century until now, certain items will be in evidence. Bottles show the drinking habits of the population, also the sauces and medicines in use. The way the bottles were made (i.e. mould or hand blown or a mixture of both) and particularly the 'stopper'device as well as embossing, can indicate a date. The type of tins show what was eaten and in what quantities. The high proportion of tins today perhaps indicate the decline in home cooking with many house wives working. People who may previously have had cooks can no longer afford to have them. Coal ash and cinders indicate several things. In the earlier part of the century there was more ash debris as the open fire was the sole means of winter heating. Now the electric or gas fire is a more economical form of heating. The amount of clothing and old furniture thrown out is much higher now than in previous times because people are so much better off. Paper is not as likely to be preserved in older dumps but it indicates reading habits in the form of newspapers, magazines etc.

Farm machinary and hand tools are also an interesting study. Tractors only began horse replacement comparit ly recently. In 1947 on a large farm near Mallow Co. Cork there were nine horses and one tractor. Since then technology has snow balled, with horse dramn implemamts becoming rapidly obsolete and being thrown onto refuse piles or into odd corners. Smaller farm utensils such as butter churns, dairying instruments, and other antiquated tools are to be found discarded. Like wise kitchen and domestic appliances like hand mincing machines, old fashioned fire extinguishers, mangles, potato boilers etc. are to be found.

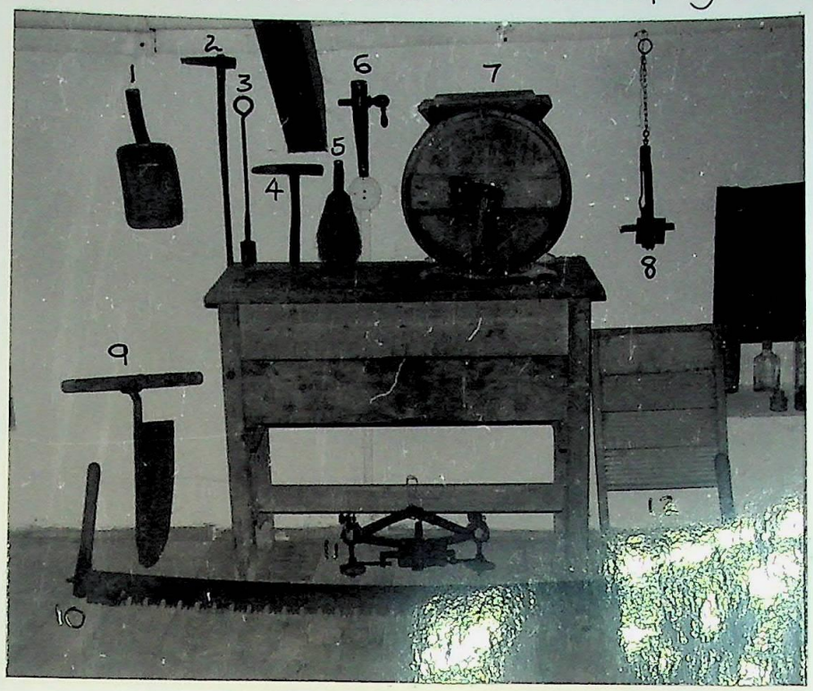
Throughout this century the standard of living has been steadily rising for nearly everybody, which is shown by the present quality and quantity of refuse.

S

An iron horse drawn scuffle with wooden handles as well as other parts of horse drawn machinery can be seen amongst a farm scrap heap.

T

DOMESTIC & FARM TOOLS which are rapidly becoming OBSOLETE.



1. Butter skimmer
2. Metal working hammer
3. Brand iron
4. Home made pick/hammer
5. Brush
6. Keg stopper.
7. Butter making churn
8. Gin trap
9. Adapted one eared spade
10. Double cross saw
11. Horn straightner
12. Washing board.

U

Cutting hay in Co. Down in 1962

A Selection of Beer Bottles From the mid 19th to about 1950

10, 13, Totally hand made.
4, 12, 14, ⑮, 17 mould made with hand made neck and ~~top~~
1, 2, 3, 5, 6, ⑧ Entirely machine made (pre-crown sealed)
⑦ ⑨ ⑪ ⑯ ⑱ Entirely machine made crown sealed.

O embossed bottles

W A selection of earthenware & stone pots for marmalade, vinegar & spices. Late 19th century & early 20th century.

X Late 19th & early 20th century mould made glass preserving jars (light green)

MODERN WASTES

When dealing with modern wastes, it is from a totally different motive and view point than when dealing with historic rubbish dumps. I am not interested in what information the rubbish can give about our contemporary society (though comparisons of composition and resulting deductions could be interesting). I am interested in the whole problem of modern waste disposal, and the possibilities of more efficient methods causing less pollution and hopefully with the production of useful by-products during the course of its disposal.

First it is important to try and clarify what the various types of waste and refuse are.

WASTE can be defined as useless, unwanted material from normal community activities which have been discarded.

solids = REFUSE
liquids = sewage, industrial waste waters (dissolved and suspended matter).
gasses = smoke, dust, fumes and gasses.

REFUSE is all the solid wastes of a community.

Average composition of domestic waste:

15% Newspapers, magazines, books, mail etc
36% All other paper and cardboard
1% Glass, ceramics,stone
8.5% Metals
8% Food waste
5.5% Dirt
5% Grass and leaves
3% Plastics
3% Textiles
3% Wood
1% Rubber and leather

CLASSIFICATION OF REFUSE MATERIAL

		from:
GARBAGE	Wastes from cooking, preparation & serving of food. Market refuse, waste from handling, storage & sale of produce & meats.	households institutions commercial concerns - eg hotels stores restaurants markets etc.
RUBBISH	Combustible primarily organic: paper, cardboard, cartons, plastics; wood, boxes, excelsior, leather, rubber; rags, cloth, bedding; grass, leaves, yard trimmings	
	Non-Combustible primarily In-organic: metals, tin cans, metal foils; stones, bricks, ceramics, crockery; glass bottles, other mineral refuse; dirt.	
ASHES	Residue from fires used for cooking and for heating buildings, cinders	
BULKY WASTES	Large autoparts, tyres stoves, refridgerators, other large appliances. furniture, large crates Trees, branches, stumps, flotage	streets pavements alleys vacant lots etc.
STREET REFUSE	street sweepings, dirt, contents of litter bins Leaves.	
DEAD ANIMALS	Small animals; cats & dogs, poultry etc. large animals; horses, cows etc.	
ABANDONED VEHICLES	cars, lorries, trucks	
CONSTRUCTION & DEMOLITION WASTES	lumber, roofing, sheeting scraps. rubble, broken concrete, plaster etc. conduit, pipe, wire, insulation etc	
INDUSTRIAL WASTES (REFUSE)	solid wastes resulting from industrial processes & manufacturing operations eg. food processing wastes boiler house cinders, wood, plastic, metal scraps & shavings	factories power plants
SPECIAL WASTES	Hazardous wastes - pathogenic wastes, explosives radioactive materials, toxic security wastes, confidential documents, negotiable papers etc.	households, hospitals, stores, institutions & industries
ANIMAL & AGRICULTURAL WASTES	manures crop residues	farms, feed lots
SEWAGE TREATMENT RESIDUES	coarse screenings : grit septic tank sludge de-watered sludge	sewage treatment plants. sephic tanks

Removal of waste is very expensive and difficult. Cost and convenience are the primary considerations. The needs of the community,with some emphasis on the long term rather than cheap short term solutions,should be concentrated on. Whatever methods of collection and disposal are adopted should be related to the local and regional circumstances.

The housewife throws away what is of no value to her. The higher the standard of living, the greater the volume of domestic waste. The volume of industry generally increases with a raise in living standards and as the industry generates affluence ,so industrial waste increases. The population too is increasing, so in that way alone, the volume of waste grows. It has been estimated that about five hundred weight of refuse/ day / every 1000 of population is produced.

REFUSE COLLECTION

Ideally, refuse collection should be clean, silent, quick and unobtrusive. Hygiene standards must be maintained, to keep down vermin such as rats, mice, flies and other scavengers.

Refuse collection is therefore a very significant factor in community life. A city with a population of half a million, employs at least 1000 refuse workers. Administration staff, engineers, drivers, street sweepers etc. are needed. The distance involved to cover a collection area and the time needed is great. The public cleansing service is also responsible for the dealing with waste products of the seasons, such as autumn leaves, ash from winter fires, snow and extra garden waste in the spring. The corporation is not obliged to collect industrial waste, and the industry must pay the corporation to remove and dump it.

In Dublin £?.75 million is spent every year to keep the city clean. 632 miles of streets and lanes have to be kept clean and refuse collection. 140,000 tonnes of domestic rubbish is collected every year. The corporation's men lift 15,000 tonnes of litter from the streets per year. 300 men are employed on the street to try and deal with the litter problem. 15 vacuum cleaners (flying dustmen) are in operation, many 3 wheeled vechicles and 32 large side loading lorries are used. 5000 brooms are worn out every year.

In Cork 5?,000tonnes of domestic refuse is removed each year. 7850 tonnes of litter is removed annally from the streets. There 192 miles of city streets and lanes with 13?,000 inhabitants. In fact the litter problem in Cork is greater than in Dublin. 5 suction sweepers and 35 manually operated ones are in use.

39

POLLUTION

The pollution aspect of refuse is an enormous problem and a very broad subject. I have condensed this part as much as possible because it is not directly relevant to ways in which waste disposal can be solved. But it does shed light on the reasons why some wastes are particularly difficult to dispose of harmlessly.

We are aware of certain types of pollution more than others. Visual pollution in varying degrees of seriousness we see every day. There is ugliness all around us but we tolerate it because we see what we want to see. J.M. Barr writes: "The physiology of the eye, the act of perception, how the eye sees are common to all sighted men; though the psycology of the eye, the art of perception, what is seen is as individual as a fingerprint."

Smell also pollutes the senses.

It is possible to categorize pollution into three main types: land, water and air pollution. Land and water pollution are the two most relevant here as they are the direct product of the efforts to dispose of domestic and industrial waste.

The least serious but most noticeable land pollution is litter. It occurs where ever people gather together, even in such remote spots as Carrantohill. A sample of litter was taken from O'Connell St. and the composition was as follows:

40

Newspapers	30.2
Cigarette boxes	10.5
Paper scraps	7.9
Bus tickets	5.4
Straw & sticks	4.6
Bottles & jars	3
Matchboxes	1.9
Twine	1.1
Rags	0.4
Vegetable matter	0.4
Fine dust	11.4

All the above are avoidable except dust.

Nothing will stop litter throwers; fines, appeals to the heart or gimmicks such as New York's talking dust bins , have little or no effect on them.

The pollution and nuisance caused by badly sited municipal dumps can be considerable. They encourage vermin, fires therefore smoke nuisance. They also smell and are unsightly. Dumping in ditches, quarries, lay-bys and larger areas of unused land is unecessary and ugly (and often illegal). Nearly all rural areas now have some sort of refuse collection so there is no excuse.

Y

It is the noxious industrial wastes that sometimes mingle with domestic refuse or are dumped seperately that are so dangerous. Pollutants such as asb-

estos provide a disposal problem. There has been a continious controversy over Ovens, Co.Cork where it has been proposed to make an asbestos dump. Asbestos is carcinogenic. Perhaps a word should be said about military waste, such as shells, spent cartridges etc which can be lethal unless stringent pre-cautions

Y Dumping continues in ditches, lay bys, etc.

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River pollution is serious in places. The Shannon is grossly affected by sewage as well as industrial wastes. Fish are dieing and other aquatic life such as amphibians and plants find it increasingly hard to survive.

The seas are greatly abused andhave to soak up all types of refuse, not only pollutants directly dumped there but much atmospheric and fresh water pol-
ution eventually ends up there as well. Prof-essor Barry Commoner is quoted as
41 saying: "The oceans have become the world's sink and the death of the oceans means the death of us all."

Widespread sea pollution is caused by sewerage, heavy metals (lead, cadmium, mercury- Minamata Bay, Japan) oil (though this is usually accidental) and the chlorinated hydro-carbons eg. D.D.T.

Perhaps the most frightening waste product of all is from the nuclear power stations. The radio-active waste takes many thousands of years to render it harmless. It is released into the environment in gaseous, liquid and solid states, at 3 levels of radio activity; low, medium and high.

Sea dumping of nuclear waste is the commonest form of disposal. Two scientists, Saddington and Teddington from Windscale nuclear plant in Cumberland have written the following:

42 "With normal effluents such as sewage the passage of some hours in sea water renders the effluent innocuous: with radio active wastes the effluent can be diluted to harmlass limits but the radiation from it can not be destroyed. The radio elements may be innocuous to man if he bathes in it but the concentrating processes are so varied, and the food chains so complex that a potential hazard exists."

Liquid medium level waste is disposed of in metal cannisters which are sunk on the sea bed. The United Nations 'Marine Pollution - Potential for Catastrophe' points out "no-one expects the containers to last for ever, even those that
43 made them.". Salt water is one of the most corrosive forces in nature. Already divers have found broken containers on the sea bed.

The high level radio active wastes are contained in steel cannisters with a jacket of concrete surrounding them. They are then buried in the ground or down mine shafts. Sometimes the waste is incinerated to lessen the bulk. But earth tremors, terrorists, bombs or human error are hazards that are all to real. Robert Arvill predicts that by A.D.2000 over three-quarters of all electricity in the U.K.will be generated by nuclear power.

DISPOSAL OF REFUSE

For the two categories of rubbish, domestic and industrial, there are at present 4 alternative methods of disposal:

1. 'Controlled' tipping.
2. Incineration.
3. Composting.
4. Re-cycling.

} a combination of 3 & 4 would solve our refuse disposal problems.

Composting is the only type dealing with sewage, as otherwise it is treated (not always) and removed via rivers and the sea.

44

'CONTROLLED' TIPPING

'Controlled' tipping is "so widely applied, so little understood and so badly abused". It should provide a method of disposal whereby the refuse can decompose to an innocuous state under non offensive conditions. Generally the waste is removed from the towns to the country because land is to valuable near towns. It is the cheapest method of disposal therefore it is the most widespread. Well over 80% of our waste is disposed of by tipping though most of it inefficiently.

Tips encourage vermin such as rats, mice, house flies and blue bottles. Fires can be caused by spontaneous combustion which occurs when rapidly decomposing refuse structurally collapses with an inrush of air. Usually much more than large quantities of water are required to put out these fires and they continue to smoulder with an unpleasant acrid odour. The warmth produced provides an added attraction for rats. Refuse is often scattered by the wind, so sufficient screens should be provided to prevent this.

The ideal conditions for decomposition in the tips is to have the refuse deposited in layers not exceeding 6 feet. All surfaces exposed should be covered over within 24 hours by a layer of tilth (earth) about 9" thick. To do this properly , a rich authority is needed which can afford full time bull-dozer workers, labourers etc. permanently at the dump site. Also a large volume of rubish is needed for the scheme to be feasible.

Tipping is sometimes combined with land reclamation schemes, reclaiming marshland or derelict land from mining and quarrying.

INCINERATION

Incineration is a method of reducing crude refuse to an innocuous state by burning. There are two distinct incineration operations; one is the burning (therefore destruction) of refuse purely to accomplish easy hygienic disposal. The second is the burning of refuse to produce heat energy or electricity as a by-product.

In the early 20th century the health authorities found it cheaper to burn refuse. This was because it had a very high calorific value because of large quantities of half-burnt coal which was cheap at that time. The refuse was burnt to generate heat for the wash-houses for the poor.

Destructors (furnaces) 1500 F —Refuse / Heat→ (Hot water for public wash-houses) → Refuse ½ weight & ¼ bulk → Clinker used for road making

But social conditions changed. Coal became more expensive so less combustible ash was thrown away. Also the housewife wanted better than a dusty wash-house. The demand for waste paper for mills has permanently reduced the calorific value of refuse.

Waste paper plants have been used to generate electricity, but the electric energy is difficult to produce in the right quantites at the right times (i.e. the peak) of the day.

The cost of renewing incinerators is very high as the design is difficult and complicated. Atmospheric pollution is one of the chief drawbacks.

N.G. Wilson at the 1953 Edinburgh Public Cleansing Conference has this to say about incineration:

> "It has taken the financial and material stringencies of war and its aftermath to turn the thoughts of local authorities away from the costly and primitive practice of burning refuse.....No matter how ingenious the machinery, the buildings and the furnaces, it is in principle no different from the humble smallholder with a bonfire, or the savage. You cannot disguise or improve the principle of a thing by elaborating it".

COMPOSTING

To understand composting fully it is necessary to go into the history of sewage and manure and its use on the land.

For centuries our farmers have made use of organic wastes to restore the soil fertility. In the medieval times they used manure on their fields and by the Tudor times they had a very efficient system of composting. The knowledge of composting was probably known in prehistoric times too.

In traditional Irish farmhouses, the dung heap was located outside the front door, the cowbyre being a continuation of the dwelling house. Until about 100 - 150 years ago, in many areas the dung heap was allowed to accumulate at the end of the living room. The following is quoted from 'A description of the Western Isle' - William Moffatt 1724:

46 "At one of th'ends he kept his cows
At th'other he kept his spouse. "

Manure for the infield was supplemented by .... 'some houses
47 having from 10 - 12 tons weight of dung , and only cleaned out once a year'.
In 1880 an observer states of Kilgever, near Westport Co. Mayo:

48 "It is a terrible thought that these huge heaps of manure above the doorsteps had all been taken from the single rooms, each of which formed a common stye for men, women, children, horses, cows, pigs and poultry".

Originally (before separated farmhouses) there was not much room for cowbyres or dairies near the clusters of clachans. Also dairying was mostly a summer occupation which took place in the booleys near common rough pasture, so cowbyres were not as necessary a the farmstead. But at least one cow would have been needed to provide milk for the family during winter, and living under cover meant she would be more productive and also provide additional warmth.

It is said that some tenants would not move their dung-heaps for fear of having their rents raised because of "improvements". The dung-heap was wealth and therefore folklore grew up around it: "where there is muck there is luck". The fertility of the farm was symbolised by muck.

The open field (infield) around the group of farmsteads was normally on the downhill side of the dwellings so the manure could be 'sliped' down the slope. Originally this was the job of the women with baskets with hinged bottoms, so that the manure could be dropped where and when required. It was only at the beginning of the 19th century that the donkey was introduced into Ireland, and then much of the manuring job was passed onto him. In some areas an adaptation of a sled with runners

is used for the transport of manure. These slipes were both hand- and horse-drawn.

Farmers living near towns brought their carts with goods for market and returned with a cart-load of manure for the land. The surrounding very fertile areas of cities have mostly been swallowed up by suburbia, but evidence remains in the street names, such as Field Street, Dale Street, Meadow Park etc. But as people became more aware of sanitation, drains and sewage systems were gradually introduced, making it increasingly difficult to get manure.

In 1877 in Halifax, the Goux system (or dry privy system) was used. Trenches were dug in covered latrines where leather shoddy and other industrial waste was added to absorb the faecal matter. The pits were cleared regularly and the contents removed to yards where it was dried in the sun the ground in mills and sold as manure.

At this time much sewage was disposed of into the waterways. The
49 river Irwell was described as "considerably less a river than a flood of liquid manure".

Dr. J.N.Thudickham describes the coming and first results of sanitation:

50 "First there was the enclosure, termed the privy, then came the wooden seat with the round hole in it: at first it was kept detached from the habitation , until the habitation was deprived of surrounding waste and became a town house , the necessary room with a cess pool attached became part of the habitation . Then to guard this habitation from the contamination which he had himself necessitated , man turned to the water-closet and robbed his field of its resources and nature of her due. At first he dirtied everything by what he cast from himself. He removed pollution a little further from his habitation by sending it into sewers but by a retribution of providence, it turned back upon him in the water which he required for washing and drinking."

Animal faeces, urine and straw form a particularly good manure matrix. Organic domestic refuse is similar to straw as it is carbonaceous and lacking in nitrogen. Refuse is collected from such wide sources that it usually contains aliberal and varying supply of minerals and trace elements. Sewage is complimenary to refuse as it is very rich in nitrogen. Sewage consists of all soiled water from sinks& baths, faecal matter, varying propertions of rain water (plus detritus and debris) as it flows off streets and rooves into drains. The two could be combined to form an excellent humus. The function of all waste organic matter both animal and vegetable is to maintain the fertility of the soil.

In this country most authorities destroy at least one of these valuable materials and usually both. Ideally town wastes should be allowed to decompose under inoffensive conditions to produce a manure of high agricultural value.

The decomposition is a fairly complicated process. Usually the sewage is decomposed seperately from the refuse. There are various ways of doing this. Sadly often after the sewage is treated to make it into a non pollutant it is released straight into the wateways and is therefore of no use to the land. Sewage can be incinerated to form a powder which makes a good manure. Sewage sludge can be digested in anaerobically sealed tanks. Sludge can also be used straight on the land. It has a high (95%) water content. Drying is a difficult process but it makes handling easier. The cleaner we are the more water we use, therefore the harder sewage is to handle. Ideally the refuse and sewage should be used together. In this case the pulverization and mixing of the two takes place and fermentation is one continious process. Specially adapted systems are in operation in some places with sucessful results.

But there are certain draw backs and complications in the system. Refuse may not be of constant composition eg. the lowering of rich ash content in smokeless zones. In industrial areas there may be excessive quantities of certain trace elements and plant poisons such as chromium, lead salts, phenols and cyanides. Glass splinters cause a major problem, but technical methods for their removal have been devised, which adds to the economic cost of the procedure.

Changes in the character of the sewage may also occur. Industries should treat their own liquid wastes before releasing them into the sewers. A day to day variation occurs with the traditional Monday wash day when the excess of detergent reduce the efficiency of sewage digestion organisms by 20%, because the oxygen absorption rate is reduced Also many of the detergents are synthetic so they are not affected by the micro-organisms, therefore they eventually make their way to water cources and fowl them up.

The final doubt that is often brought up is one of hygeine. There is a certain revulsion amongst a number of people to the thought of using human sewage on the land because of the passing on of disease etc. Experiments using untreated sewage show that there are no adverse effects to either the animals or plants that live off the manured soil. It simply promotes excellent plant growth.

The Journal of the Royal Society of Arts sums up composting:

> "It appears to me that nature, following her general system of reproduction prepares this matter (i.e. night soil) in the perfect manner for the purpose of feeding vegetables and raising them to the very highest pitch of excellence and it is certain that herbage growing under these circumstances is capable of fattening the largest cattle in less time than any other. The importance in this kind of manure being so evident, I am sure the society will feel equally with me, the most poignant regret, when they take into their consideration that 99% of this valuable is constantly and most absurdly carried by sewers and drains into the rivers and thereby totally lost to the purposes of agriculture for which it is so admirably adapted."

Alder man Machi (one of the closet philosophers) in the middle 19th century, advocated good book-keeping and liquid sewage for sucessful farming.

RECYCLING

In this time of energy crises, shortages etc. the amount of potentially recyclable materials being wasted is inexcusable. With the growing population and an enormous volume of rubbish, particularly as most packets etc.are now disposable, it is more important to re-use these materials. Recycling minimises the dependance on exploiting raw materials, causes less pollution , as well as solving the increasing problem of space for dumping waste.

Down through history, there has always been some value in waste materials, especially scrap metals. Scrap dealers, rag and bone merchants has a thriving trade in the last century. But "the days when women stood amongst refuse ris- to their waists as they inhailed the gasses of putrefication from decaying matter, to earn 7/- a week for pulling out specific articles from London's refuse, have gone for ever."

Youth and charitable organizations extract valuable items from domestic refuse eg. milk tops for the blind, postage stamps, old christmas cards and newspapers. These items are only on a very small scalebut if they are profitable at this level, they would be more so on a larger scale.

The following is an approximate analysis of domestic refuse with emphasis on the recyclable materials.

1. REFUSE DUST. It can be used to make bricks. It is difficult to handle so it is best used as an ingredient for composting. It is very dusty.

2. VEGETABLE MATTER & FOOD. The bulk can be used for pigs. It is best to treat market and abbatoir wastes in steam boilers to concentrate and sterilize it as kitchen wastes in particular tend to be bulky and wet. The steam pressure is 80 lbs/sq.inch. It is constantly agitated to form a grey pudding. The problem is with razors, pins, needles and zinc and lead from paint. The food waste particularly before the war was terrible. Over 10% of the refuse was food. It is estimated that one third of all the food prepared for human consumption is wasted. Vegetable matter is also suitable for composting.

3. CINDERS. They are a low grade fuel, as they are not very pure and are only suitable for slow combusting stoves. Useful for composting.

4. RAGS. Particularly clean ones have a commercial value. Old carpets and jute can be used in making linoleum.

5. PAPER. There is now a great demand for waste paper for pulp in paper mills.

6. BONES& other PHOSPHATIC WASTES. These have a high commercial value. They are used in the preparation of fertilizers, composts, animal foods, and glue. They are hard to exploit because they are seldom in large quantities all together.

7. METALS. Ferrous - iron and steel both have scrap value.
Non-ferrous - tin cans are pressed into bales.

7. COMBUSTIBLE DEBRIS. Eg. wood , leather ,durable matter (organic). It is either burnt or pulverized and then composted.

8. GLASS. Bottles and cullet (broken glass) have a scrap value.

10. PLASTICS. They have a scrap and calorific value.

11. INCOMBUSTIBLE debris. This has no commercial value and is useless for composting or burning eg. stones, bricks, ceramics etc..

The main problem of recycling is the actual seperation and collection of the materials. The housewife in general is unco-operative and will do little seperation in the home. Machines have been built to seperate the different types of refuse. But they are very expensive and only the richest authorities dealing with huge amounts of refuse could afford them and exploit them economically.

Briefly, the seperation machines work as follows, with minor variations. There a number of rotating screens. The first has perforations of 3/8" for thin ash and dust to go through. The weight of the refuse is halved though there is no appreciable difference in bulk.

The second set of perforations are about 2" in diameter. It is specifically for cinders but stones glass, crockery fragments, potato peelings etc. go through too. These reduce the quality of the cinders as a fuel. This part constitutes $\frac{1}{4}$ of the total refuse in weight.

All the remaining refuse travels on a horizontally moving belt. There is a magnetic strip about 15" above it,so anything containing iron,sticks to the strip until the magnet drops it all own a shoot where a pressure of 750 lbs/sq, inch is exerted to compress it.

Men standing alongside the belt have specific articles to pick off it. The best of the paper is picked out, put in a hopper to be sent to the paper mills. Textiles of various kinds such as woolens, mixed clean and dirty rags, carpets, jute etc are collected. Bottles and bones are picked off, as well as food and vegetable matter. The remaining material on the belt is an unidentifiable mish-mash of material, most of which can be used for composting.

Using certain combinations of composting and recycling, the whole refuse problem could be eliminated. Materials not finding a commercial outlet or a market in scrap, could be used for composting. All sewage could be incoperated in the composting schemes combined with a methane producing plant.

CONCLUSION

53 We have seen that"man is a"wasting animal" . His refuse indicates by its quantity and by what it contains, the life style and culture of the men that made it.

These material remains are in many cases the only evidence left of the existence of certain cultures. From the refuse alone we must make deductions as to the mental, economic and social life of the inhabitants. Detail can be gained of the agrictural and tool making methods. A particularly informative outline of the diet can be deduced from the bones, shells, grains, and other food remains.

The standards of living and progress through the ages can be assessed from the rate of refuse accumulation. Kitchen middens for example , accumulated over centuries but the equivalent volume of refuse would today be produced by any town in less than a week.

But we now have a massive problem of how to dispose of our refuse efficiently and benefficially. At present it is causing pollution and nuisance but with correct handling and planning our refuse could be used to good advantage in recycling, composting and reclamation schemes.

PERSONAL NOTES

The investigation of refuse combines many things I am interested in. Man's accumulation of refuse from the Stone Age to the present day gives an insight into the domestic life of the times. In the summer I worked on an archeological dig in Westmeath drawing the 'finds'. It was a 6th century ritual site with a variety of interesting features. Iwas fascinated by how much could be learnt from finds such as pottery fragments, discarded plough pebbles, numerous bones and some rarer artifacts.

I have always enjoyed digging in dumps and walking along the sea shore, finding old bits of drift wood, bones, bottles, pebbles and occasionally, interesting metalic objects. These things have often been a source of inspiration for my drawings, in particular bones and skulls. There is always the possibility of unearthing an article attractive enough to take home. I have a partiality to glass and have collected numerous and jars which display various colours, shapes and flaws.

I cannot forget the undisirable aspects of waste, so important to us today, which brings us to the emotive problem of conservation. This embraces such diverse problems as those ranging from nuclear wastes to pernicious silage effluents.

So in this thesis I have tried to combine these subjects. I have tried to confine it to Ireland as there is more easily acessible information in the museums, libraries and in the field.

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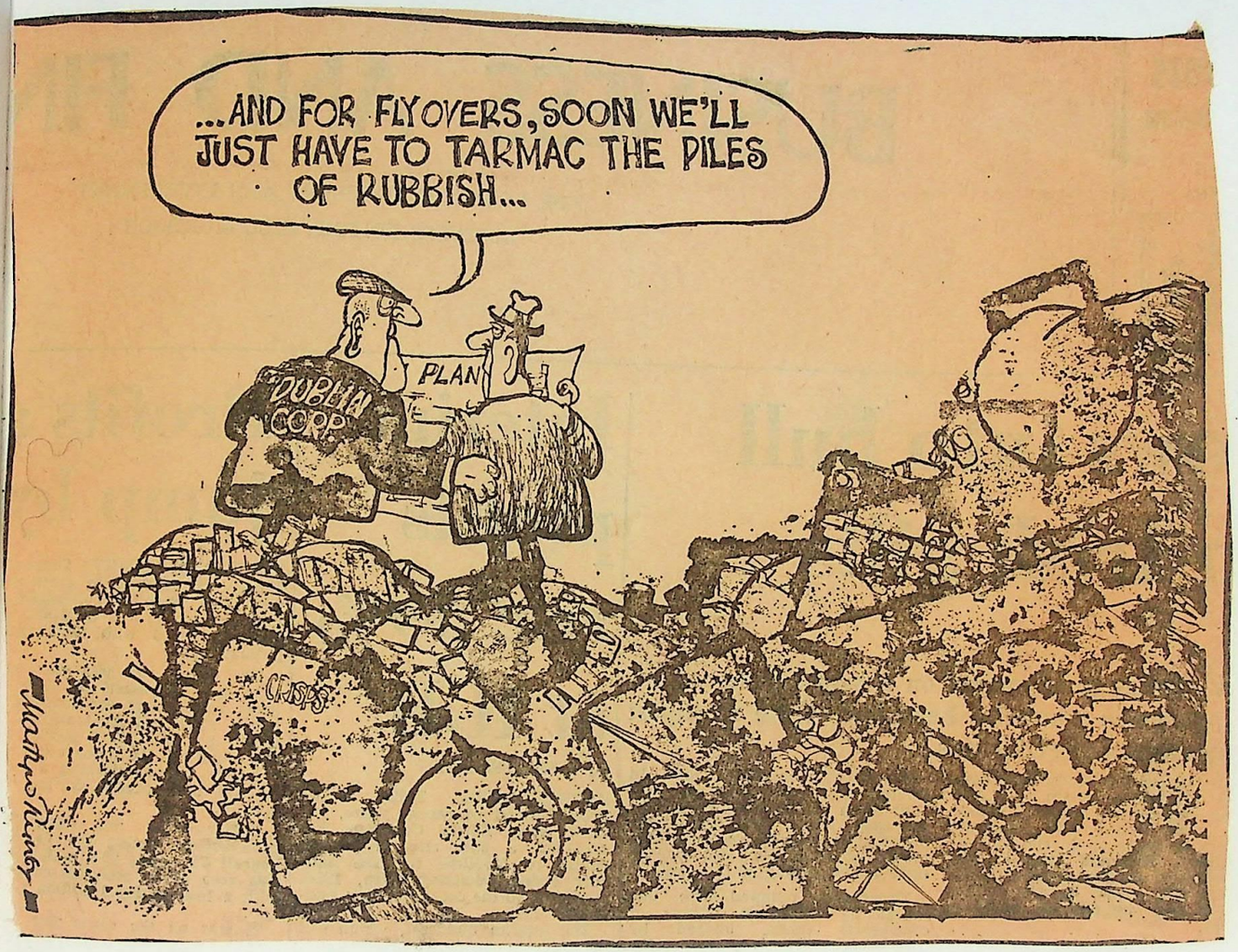
...AND FOR FLYOVERS, SOON WE'LL JUST HAVE TO TARMAC THE PILES OF RUBBISH...
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