

Breaking the Vigenère Cipher

ECE 458 Computer Security
Assignment 1

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1 Finding the Key Length

The first step taken to find the length of the key was to use a method of counting repetition, or coincidence counting, known as the Index of Coincidence (IC).

1.1 The Index of Coincidence

The IC provides statistical information on letter repetition in the cipher text. Since the Vigenère cipher uses multiple Caesar ciphers, or letter shifts, letter repetition should occur periodically with respect to the key size used. The formula used to calculate the IC can be seen in Formula 1

$$IC = c \times \left(\frac{\sum_{i=a}^z t_i(t_i - 1)}{N(N - 1)} \right) \quad (1)$$

The constant values in Formula 1 are equal to twenty-six and the length of the Caesar cipher, for c and N respectively. Constant c is equal to twenty-six due to the number of lower-case letters in the English alphabet.

1.2 Experimental Findings

To determine the period of the Vigenère cipher a key length of two is first assumed and then incremented for each round of calculations. Each round consists of splitting the cipher text into its appropriate Caesar ciphers based on the size of the assumed key. The IC is then calculated for each Caesar cipher, and those values are averaged and recorded for the appropriate assumed key size. This is done for each key length and once a local maximum in the calculated ICs is detected, the appropriate length is added to a list. Once another local maximum is found that has a length modulo a previously recorded list entry, repetition is discovered and a key length is assumed within reason. Table 1 shows the calculated ICs for the cipher text listed in Appendix A.

Key Size	Average IC
2	1.14176
3	1.14774
4	1.15442
5	1.16435
6	1.17700
7	1.74900
8	1.20709
9	1.22576
10	1.24609
11	1.26764
12	1.29257
13	1.31984
14	1.90699

Table 1: Average IC values corresponding to assumed key size

The data in Table 1 shows that local maxima were detected at a key length of both seven and fourteen. In the next section, Finding the Vigenère Key, a key length of seven is assumed for the procedure.

2 Finding the Vigenère Key

The next step is to use the assumed key size and apply the chi-squared statistic to detect which keys produce an English-like output.

2.1 Chi-Squared

The Chi-squared distribution, or the x^2 distribution, is a measure of the similarity between two categorical probability distributions. The Chi-squared value of each key, or shift, for each Caesar cipher can be calculated using Formula 2.

$$x^2(C, E) = \sum_{i=a}^z \frac{(C_i - E_i)^2}{E_i} \quad (2)$$

By applying this technique, the frequency distribution of a letter in the cipher text can be compared to the expected occurrence of a letter in the English language. Table 2 shows the probability of each English letter occurring in plain text, based on the analysis of the entries in the Concise Oxford dictionary.

Letter	Frequency
a	8.167%
b	1.492%
c	2.782%
d	4.253%
e	12.702%
f	2.228%
g	2.015%
h	6.094%
i	6.966%
j	0.153%
k	0.772%
l	4.025%
m	2.406%
n	6.749%
o	7.507%
p	1.929%
q	0.095%
r	5.987%
s	6.327%
t	9.056%
u	2.758%
v	0.978%
w	2.361%
x	0.150%
y	1.974%
z	0.074%

Table 2: Relative frequencies of letters in the English language

2.2 Experimental Findings

To determine the appropriate shift corresponding to Vigenère key letter, the chi-squared value for each letter within each individual Caesar cipher must be calculated. The lowest chi-squared value indicates greater similarity between the decrypted text and expected English letter frequency. Since a key size of seven was

determined previously, there are only seven Caesar ciphers to break. Table 3 shows the calculated chi-squared values for the first Caesar cipher.

Vigenère Letter	Chi-squared
a	68515.9
b	64846.6
c	28201.5
d	35035.2
e	40212.6
f	23557.8
g	51.2082
h	54737.4
i	31444.6
j	64257.1
k	31510
l	100181
m	16527
n	47891.1
o	36131.2
p	54499.9
q	62195.1
r	21416.6
s	15850.4
t	16853.7
u	97618.7
v	34791.7
w	23516.6
x	48517.8
y	50781.2
z	32256.5

Table 3: Relative frequencies of letters in the English language

Based on the data displayed in Table 3, the Vigenère letter that resulted in the lowest chi-squared value for the first Caesar cipher was “g”. When the same process is applied to the remaining Caesar ciphers, the resulting Vigenère key is “gwtlhti”.

3 Conclusion

Based on the experimental data found using the Index of Coincidence and chi-squared distribution the Vigenère key was determined to be “gwtlhti” and the decrypted plain text can be seen in Appendix B. The plain text is an excerpt from George Orwell’s novel 1984.

Appendix A Cipher Text

nelpfaxayzjnakhyaamvwzpxoovzczzkzmshmenepoxagpapsitkolwffcyegroxpgztwzhjkaghybbojzlmquqz
siriaphxhmqiwvephvgjwapiyjhvwgoknmllisavchfxkzthrpixzaluwexemtuziyxxqvkmmnelalpggzlwpwduhnaan
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teitkqwlpulmubvztitkpxslexralduxaydtokxaiagolwcvkgspfbuxxrpgeopaslwqjjhergwcsbeotveyxcatqtpreotbzd
bddtaopffzmjknhfuihkneaaizztellqtxslpiybttyegyqkpaaidzbdhzmwleobzzugtuxitzapixtoaopkmpgpapotlh
axyihztegyuczemhhlvkrxcwhayeuwlgwewwflbulbykhetwgjtbksbeobvguxlyhzzshovpvcemsihohnheoxz

Appendix B Plain Text

his eyes refocused on the page he discovered that while he sat helplessly musing he had also been writing as though by automatic action and it was no longer the same cramped awkward handwriting as before his pen had slid voluptuously over the smooth paper printing in large neat capitals swar is peace for whom it suddenly occurred to him to wonder was he writing this diary for the future for the unborn his mind hovered for a moment round the doubtful date on the page and then fetched up with a bump against the newspeak word doublethink for the first time the magnitude of what he had undertaken came home to him how could you communicate with the future it was of its nature impossible either the future would resemble the present in which case it would not listen to him or it would be different from it and his predicament would be meaningless it was a bright cold day in april and the clocks were striking thirteen winston smith his chin nuzzled into his breast in an effort to escape the vile wind slipped quickly through the glass doors of victory mansion though not quickly enough to prevent a swirl of gritty dust from entering along with him inside the flat a fruity voice was reading out a list of figures which had something to do with the production of pig iron the voice came from a long metal plaque like a dulled mirror which formed part of the surface of the high hand wall winston turned as with a switch and the voice sank somewhat though the words were still distinguishable the instrument the telescreen it was called could be dimmed but there was no way of shutting it off completely he moved over to the window a smallish frail figure the meagreness of his body merely emphasized by the blue overall which was the uniform of the party his hair was very fair his face naturally sanguine his skin roughened by coarse soap and blunt razor blades and the cold of the winter that had just ended down with big brother winston kept his back turned to the telescreen it was safer though as he well knew even a back can be revealing a kilometre away the ministry of truth his place of work towered vast and white above the grimy landscape his thought with a sort of vague distaste this was london chief city of a free strip one itself the third most populous of the provinces of oceania he tried to squeeze out some childhood memory that should tell him whether london had always been quite like this were there always these vestiges of the nineteenth century houses their side shored up with baulks of timber their windows patched with cardboard and their roofs with corrugated iron their crazy garden walls sagging in all directions and the bombed sites where the plaster dust swirled in the air and the willow herb straggled over the heaps of rubble and the places where the bombs had cleared a larger patch and there had sprung up sordid colonies of woodend wellings like chicken houses but it was no use he could not remember nothing remained of his childhood except a series of bright little tableaux occurring against no background and mostly unintelligible the thing that he was about to do was to open a diary this was not illegal nothing was illegal since there were no longer any laws but if detected it was reasonably certain that it would be punished by death or at least by twenty five years in a forced labour camp winston fitted an ibino to the pen holder and sucked it to get the grease off the pen was an archaic instrument seldom used even for signatures and he had procured one furtively and with some difficulty simply because of a feeling that the beautiful cream paper deserved to be written on with a real nib instead of being scratched with an ink pencil actually he was not used to writing by hand apart from very short notes it was usual to dictate everything into the speakwrite which was of course impossible for his present purpose he dipped the pen into the ink and then faltered for just a second at the moment he had gone through his bowel to mark the paper was the decisive act in small clumsy letters he wrote the ministry of truth contained it was said three thousand rooms above ground level and corresponding ramifications below scattered about london there were just three other buildings of similar appearance and sizes so completely did they dwarf the surrounding architecture that from the roof of victory mansions you could see all four of them simultaneously they were the homes of the four ministries between which the entire apparatus of government was divided the ministry of truth which concerned itself with news entertainment education and the fine arts the ministry of peace which concerned itself with war the ministry of love which maintained law and order and the ministry of plenty which was responsible for economic affairs their names in newspeak were minipax miniluv and miniplenty ignorance is strength freedom is slavery suddenly he began writing in sheer panic only imperfectly aware of what he was setting down his small but childish handwriting straggled up and down the pages shedding first its capital letters and finally even its full stops winston turned round abruptly he had set his features into the expression of quiet optimism which it was advisable to wear when facing the telescreen he crossed the room into the tiny kitchen by leaving the ministry at this time of day he had sacrificed his lunch in the canteen and he was aware that there was no food in the kitchen except a hunk of dark coloured bread which had got to be saved for tomorrow's breakfast he took down from the shelf a bottle of colourless liquid with a plain white label marked victory gin it gave off a sickly oily smell as of Chinese rice spirit winston poured out nearly a teacupful nerv ed himself for a shock and gulped it down like a dose of medicine it had happened that morning at the ministry if anything one bulbous could be said to happen the ministry of love was there really frightening on the other were now windows in it at all winston had never been inside the ministry of love nor within half a kilometre of it it was a place impossible to enter except on official business and then only by penetrating through a maze of barbed wire entanglements steel doors and hidden machineries in the gutter of the streets leading up to its outer barriers were roamed by gorilla faced guards in black uniforms armed

with jointed truncheon she did not do so however because he knew that it was useless whether he wrote down with big brother or whether he refrained from writing it made no difference whether he went on with the diary or whether he did not go on with it made no difference that he thought police would get him just the same he had committed would still have committed even if he had never set pen to paper the essential crime that contained all others in itself thought crime they called it though crime was not a thing that could be concealed for every one might dodge successfully for a while even for years but sooner or later they were bound to get you the hallways smelt of boiled cabbage and old rag mats at one end of it a coloured poster too large for indoor display had been tacked to the wall it depicted simply an enormous face more than a metre wide the face of a man of about forty five with a heavy black moustache and ruggedly handsome features winston made for the stairs it was now set trying the lift even at the best of times it was seldom working and at present the electric current was cut off during daylight hours it was part of the economy drive in preparation for a week the flat was seven flights up and winston how was thirty nine and had a varicose ulcer above his right ankle went slowly resting several times on the way one each landing opposite the lift shaft the poster with the enormous face gazed from the wall it was one of those pictures which are contrived that the eyes follow you about when you move big brother is watching you the caption beneath it ran april the first last night to the flicks all war films one every good one of a ship full of refugees being bombed somewhere in the mediterranean audience much amused by shots of a great huge fat man trying to swim away with a helicopter after him first you saw him wallowing along in the water like a porpoise then you saw him through the helicopter's gun sight then he was full of holes and these around him turned pink and he sank suddenly as though the holes had let in the water audience shout with laughter when he sank then you saw a lifeboat full of children with a helicopter hovering over it there was a middle aged woman might have been a Jewess sitting up in the bow with a little boy about three years old in her arms little boys screaming with fright and hiding his head between her breasts as if he was trying to burrow right into her and the woman putting her arms round him and comforting him although she was blue with fright herself all the time covering him up as much as possible as if she thought her arms could keep the bullet off him then the helicopter planted a kilo bomb among them terrific flash and the boat went all to matchwood then there was a wonderful shot of a child's arm going up up up right up into the air a helicopter with a camera in its nose must have followed it up and there was a lot of applause from the party seats but a woman down in the prole part of the house suddenly started kicking up a fuss and shouting they didn't oughter of show it not in front of kids they didn't it ain't right not in front of kids it ain't until the police turned her out didn't suppose anything happened to her nobody cares what the prole say typical prole reaction they never down with big brother but the face of big brother seemed to persist for several seconds on the screen as though the impact that it had made on every one's eyeballs was too vivid to wear off immediately the little sandy haired woman had flung herself forward over the back of the chair in front of her with a tremulous murmur that sounded like my saviour she extended her arm towards the screen then she buried her face in her hands it was apparent that she was uttering a prayer down with big brother outside even through the shut window panes the world looked cold down in the street little eddies of wind were whirling dust and dirt paper into spirals and though the sun was shining and the sky a harsh blue there seemed to be no colour in anything except the poster that were plastered everywhere the black moustache of the face gazed down from every commanding corner there was one on the house front immediately opposite big brother is watching you the captions said while the dark eyes looked deep into winston's own down at street level another poster torn at one corner flapped fitfully in the wind alternately covering and uncovering the single wordings so in the far distance a helicopter skimmed down between the roofshove red for an instant like a blue bottle and darted away again with a curving flight it was the police patrols nooping into people's windows the patrols did not matter however only the thought of police mattered in its second minute the hateroset of a few nzy people were leaping up and down in their places and shouting at the top of their voices in an effort to drown the maddening bleating voice that came from the screen the little sandy haired woman had turned bright pink and her mouth was opening and shutting like that of a landed fish even nobriens heavy face was flushed he was sitting very straight in his chair his powerful chest swelling and quivering as though he were standing up to the assault of a wave the dark haired girl behind winston had begun crying out swines swines wine and suddenly she picked up a heavy newspeak dictionary and flung it at the screen it struck goldstein's nose and bounced off the voice continued inexorably in a lucid moment winston found that he was shouting with the others and kicking his heel violently against the rung of his chair the horrible thing about the woman it was not that one was obliged to act apart but on the contrary that it was impossible to avoid joining in within thirty seconds any pretence was always unnecessary a hideous ecstasy of fear and vindictiveness a desire to kill to torture to smash faces in with a shoddy hammer seemed to flow through the whole group of people like an electric current turning one even against one's will into a grimacing screaming lunatic and yet the rage that one felt was an abstract undirected emotion which could be switched from one object to another like the flame of a blow lamp thus at one moment winston's hatred was not turned against goldstein at all but on the contrary against big brother the party and the thought of police and at such moments his heart went out to the lonely derided heretic on the screen sole guardian of truth and sanity in a world of flies and yet the very next instant he was at one with the people about him and all that was said of goldstein seemed to

into being true at those moments his secret loathing of big brother changed into adoration and big brother seemed to tower upon an invincible fearless protector standing like a rock against the hordes of asia and goldstein in spite of his isolation his helplessness and the doubt that hung about his very existence seemed like some sinister enchanter capable by the mere power of his voice of wrecking the structure of civilization ignorance is strength instantly his face turned scarlet and the water ran out of his eyes the stuff was like nitric acid and moreover in swallowing it one had the sensation of being hit on the back of the head with a rubber club then the next moment however the burning in his belly died down and the world began to look more cheerful he took a cigarette from a crumpled packet marked victory cigarettes and incautiously held it upright whereupon the tobacco fell out onto the floor with the next he was more successful he went back to the living room and sat down at a small table that stood to the left of the television from the table drawer he took out a penholder a bottle of ink and a thick quarto sized blank book with a red back and a marbled cover already he sat as still as a mouse in the futile hope that when over it was might go away after a single attempt but not the knocking was repeated the worst thing of all would be to delay his heart was thumping like a drum but his face from long habit was probably expressionless he got up and moved heavily toward the door as usual the face of emmanuel goldstein the enemy of the people had flashed onto the screen there were here issues here and there among the audience the little sandy haired woman gave a squeak of mingled fear and disgust goldstein was there negated and backslider who once long ago how long ago nobody quite remembered had been one of the leading figures of the party almost on a level with big brother himself and then had engaged in counterrevolutionary activities had been condemned to death and had mysteriously escaped and disappeared the programmes of the woman inuteshate varied from day to day but there was none in which goldstein was not the principal figure he was the primal traitor the earliest defiler of the party's purity all subsequent crimes against the party all treacheries acts of sabotage heresies deviations sprang directly out of his teachings somewhere or other he was still alive and hatching his conspiracies perhaps somewhere beyond these under the protection of his foreign paymasters perhaps even so it was occasionally rumoured in some hiding place in oceania itself then the next moment a hideous grinding speech as of some monstrous machine running without oil burst from the big television at the end of the room it was a noise that set one's teeth on edge and bristled the hair at the back of one's neck the hate had started the hate rose to its climax the voice of goldstein had become an actual sheep's bleat and for an instant the face changed into that of a sheep then the sheep's face melted into the figure of a Eurasian soldier whose seemed to be advancing huge and terrible his submachine gun roaring and seeming to spring out of the surface of the screen so that some of the people in the front row actually flinched backwards in their seats but in the same moment drawing a deep sigh of relief from everybody the hostile figure melted into the face of big brother black haired black moustachiod full of power and mysterious calm and so vast that it almost filled up the screen nobody heard what big brother was saying it was merely a few words of encouragement the sort of words that are uttered in the din of battle not distinguishable individually but restoring confidence by the fact of being spoken then the face of big brother faded away again and instead the three slogans of the party stood out in bold capitals for a moment he was seized by a kind of hysteria he began writing in a hurried untidy scrawl the ministry of truth minute true in newspeak was startlingly different from many other objects in sight it was an enormous pyramidal structure of glittering white concrete soaring up terrace after terrace metres into the air from where winston stood it was just possible to read picked out on its white face the elegant lettering of the three slogans of the party for some reason the television in the living room was in an unusual position instead of being placed as was normal in the end wall where it could command the whole room it was in the longer wall opposite the window to one side of it there was a shallow alcove in which winston was now sitting and which when the flats were built had probably been intended to hold bookshelves by sitting in the alcove and keeping well back winston was able to remain outside the range of the television so far as sight went he could be heard of course but so long as he stayed in his present position he could not be seen it was partly the unusual geography of the room that had suggested to him the thing that he was now about to do for some time he sat gazing stupidly at the paper the television had changed over to strident military music it was curious that these seemed not merely to have lost the power of expressing himself but even to have forgotten what it was that he had originally intended to say for weeks past he had been making ready for this moment and it had never crossed his mind that anything would be needed except courage the actual writing would be easy all he had to do was to transfer to paper the interminable restless monologue that had been running inside his head literally for years at this moment however even the monologue had dried up moreover his varicose ulcer had begun itching unbearably he dared not scratch it because if he did so it always became inflamed these seconds were ticking by he was conscious of nothing except the blankness of the page in front of him the itching of the skin above his ankle the blaring of the music and a slight booziness caused by the gin it was nearly eleven hundred and in the records department where winston worked they were dragging the chairs out of the cubicles and grouping them in the centre of the hall opposite the big television in preparation for the woman inuteshate winston was just taking his place in none of the middle rows when two people whom he knew by sight but had never spoken to came unexpectedly into the room one of them was a girl whom he often passed in the corridor she did not know her name but he knew that she worked in the fiction department presumably since he had sometimes seen her with oily hands and carrying gaspans she had some

chanical job on one of the novel writing machines she was a bold looking girl of about twenty seven with thick hair a freckled face and swift athletic movements a narrow scarlet sash emblem of the junior antisex league was wound several times round the waist of her overalls just tightly enough to bring out the shapeliness of her hips winston had disliked her from the very first moment of seeing her he knew the reason it was because of the atmosphere of hockey fields and cold baths and community hikes and general clean mindedness which she managed to carry about with her he disliked nearly all women and especially the young and pretty ones it was always the women and above all the young ones who were the most bigoted adherents of the party the swallowers of slogan and the amateur spies and nosers out of unorthodoxy but this particular girl gave him the impression of being more dangerous than most once when they passed in the corridors he gave her a quick side long glance which seemed to pierce right into him and for a moment had filled him with black terror the idea had even crossed his mind that she might be an agent of the thought police that it was true was very unlikely still he continued to feel a peculiar uneasiness which had fear mixed up in it as well as hostility whenever she was anywhere near him winston stopped writing partly because he was suffering from cramp he did not know what had made him pour out this stream of rubbish but the curious thing was that while he was doing so a totally different memory had clarified itself in his mind to the point where he almost felt equal to writing it down it was when he realized because of this other incident that he had suddenly decided to come home and begin the diary today winston's diaphragm was constricted he could never see the face of goldstein without a painful mixture of emotions it was a lean Jewish face with a great fuzzy aureole of white hair and a small goat beard a clever face and yet somehow inherently despicable with a kind of senile silliness in the long thin nose near the end of which a pair of spectacles was perched it resembled the face of a sheep and the voice too had a sheep like quality goldstein was delivering his usual venomous attack upon the doctrines of the party an attack so exaggerated and perverse that a child should have been able to see through it and yet just plausible enough to fill one with an alarmed feeling that other people less level headed than oneself might be taken in by it he was abusing big brother he was denouncing the dictatorship of the party he was demanding the immediate conclusion of peace with Eurasia he was advocating freedom of speech freedom of the press freedom of assembly freedom of thought he was crying hysterically that the revolution had been betrayed and all this in rapid polysyllabic speech which was a sort of parody of the habitual style of the orator of the party and even contained newspeak words more newspeak words indeed than any party member would normally use in real life and all the while the stones should be in any doubt as to the reality which goldstein's specious claptrap covered behind his head on the television screen he marched the endless columns of the Eurasian army row after row of solid looking men with expressions of Asiatic faces whose wam up to the surface of the screen and vanished to be replaced by other exactly similar the dull rhythmic tramp of the soldiers' boots formed the background to goldstein's bleating voice he sat back in his chair slightly ashamed of himself and laid down the pen then the next moment he started violently there was a knocking at the door momentarily he caught his eye O'Brien had stood up he had taken off his spectacles and was in the act of resettling them on his nose with his characteristic gesture but there was a fraction of a second when their eyes met and for as long as it took to happen winston knew yes he knew that O'Brien was thinking the same thing as himself an unmistakable message had passed it was as though their two minds had opened and the thoughts were flowing from one into the other through their eyes as with you O'Brien seemed to be saying to him I know precisely what you are feeling I know all about your contempt your hatred your disgust but don't worry I am on your side and then the flash of intelligence was gone and O'Brien's face was as inscrutable as every body else's before the hate had proceeded for thirty seconds uncontrolled exclamations of rage were breaking out from half the people in the room the self satisfied sheep like face on the screen and the terrifying power of the Eurasian army behind it were too much to be borne besides the sight or even the thought of goldstein produced fear and danger automatically he was an object of hate more constant than either Eurasia or East Asia since when Oceania was at war with one of these powers it was generally at peace with the other but what was strange was that although goldstein was hated and despised by everybody although every day and a thousand times a day on platforms on the television in newspapers in books his theories were refuted smashed ridiculed held up to the general gaze for the pitiful rubbish that they were in spite of all this his influence never seemed to grow less always there were fresh dupes waiting to be seduced by him a day never passed when spies and saboteurs acting under his directions were not unmasked by the thought police he was the commander of a vast shadowy army an underground network of conspirators dedicated to the overthrow of the state the brotherhood its name was supposed to be there were also his whispered stories of a terrible book a compendium of all the heresies of which goldstein was the author and which circulated clandestinely here and there it was a book without a title people referred to it if at all simply as the book but one knew of such things only through vague rumours neither the brotherhood nor the book was a subject that any ordinary party member would mention if there was a way of avoiding it war is peace freedom is slavery that was all and he was already uncertain whether it had happened such incidents never had any sequel all that they did was to keep alive in him the belief or hope that others besides himself were the enemies of the party perhaps the rumours of vast underground conspiracies were true after all perhaps the brotherhood really existed it was impossible in spite of the endless arrests and confessions and executions to be sure that the brotherhood was not simply a myth some days

he believed in it some days not there was no evidence only fleeting glimpses that might mean anything or nothing snatch
 es of overheard conversation faint scribbles on lavatory walls once even when two strangers met a small movement of the
 hand which had looked as though it might be a signal of recognition it was all guesswork very likely he had imagined every-
 thing he had gone back to his cubicle without looking at O'Brien again the idea of following up their momentary contact
 hardly crossed his mind it would have been inconceivably dangerous even if he had known how to set about doing it for a sec-
 ond two seconds they had exchanged an equivocal glance and that was the end of the story but even that was a memorabl-
 e event in the locked loneliness in which one had to live they'll shoot me I don't care they'll shoot me in the back of the neck I do-
 n't care down with big brother they always shoot you in the back of the neck I don't care down with big brother behind win-
 ston's back the voice from the telescreen was still babbling away about pig iron and the overfulfilment of the ninth three-year
 plan the telescreen received and transmitted simultaneously any sound that Winston made above the level of a very low
 whisper would be picked up by it more or less as he remained within the field of vision which the metal plaque comm-
 anded he could be seen as well as heard there was of course now a way of knowing whether you were being watched at any give-
 n moment how often or on what system the thought police plugged in on any individual wire was guesswork it was even co-
 nceivable that they watched everybody all the time but at any rate they could plug in your wire whenever they wanted to
 you had to live did live from habit that became instinct in the assumption that every sound you made was overheard and
 except in darkness every movement scrutinized the other person was a man named O'Brien a member of the inner party an
 holder of some post so important and remote that Winston had only a dim idea of its nature a momentary hush passed ov-
 er the group of people round the chairs as they saw the black overalls of an inner party member approaching O'Brien was a
 large burly man with a thick neck and a coarse humorous brutal face in spite of his formidable appearance he had a certain
 charm of manner he had a trick of resettling his spectacles on his nose which was curiously disarming in some indefinable
 way curiously civilized it was a gesture which if anyone had still thought in such terms might have recalled a nineteenth
 century nobleman offering his snuff box Winston had seen O'Brien perhaps a dozen times in almost as many years she felt de-
 eply drawn to him and not solely because he was intrigued by the contrast between O'Brien's urban manner and his prize-
 fighters physique much more it was because of a secretly held belief for perhaps not even a belief merely a hope that O'Brien's
 political orthodoxy was not perfect something in his face suggested it irresistibly and again perhaps it was not even an or-
 thodoxy that was written in his face but simply intelligence but at any rate he had the appearance of being a person that y-
 ou could talk to if somehow you could cheat the telescreen and get him alone Winston had never made the smallest effort to
 verify this guess indeed there was now a way of doing so at this moment O'Brien glanced at his wrist watch saw that it was nea-
 rly eleven hundred and evidently decided to stay in the records department until the two minutes he was over he took a
 chair in the same row as Winston a couple of places away a small sandy-haired woman who worked in the next cubicle to Wi-
 nston was between them the girl with dark hair was sitting immediately behind Winston roused himself and sat up straight
 then he let out a belch the girl was rising from his stomach at this moment the entire group of people broke into a deep slow
 rhythmic chant of bbb over and over again very slowly with a long pause between the first and the second a heavy mur-
 murous sound somehow curiously savage in the background of which one seemed to hear the stamp of naked feet and the
 throbbing of tom-toms for perhaps as much as thirty seconds they kept it up it was a refrain that was often heard in momen-
 ts of overwhelming emotion partly it was a sort of hymn to the wisdom and majesty of big brother but still more it was a
 sort of self-hypnosis a deliberate drowning of consciousness by means of rhythmic noise Winston's entrails seemed to grow co-
 ld in the two minutes he could do nothing but sharing in the general delirium but this subhuman chanting of bbb always fi-
 lled him with horror of course he chanted with the rest it was impossible to do other wise to dissemble your feelings to con-
 trol your face to do whatever everyone else was doing was an instinctive reaction but there was a space of a couple of seconds du-
 ring which the expression of his eyes might conceivably have betrayed him and it was exactly at this moment that the sig-
 nificant thing happened if indeed it did happen it was always at night the arrests invariably happened at night the sudde-
 n jerk out of sleep the rough hand shaking your shoulder the light glaring in your eyes the ring of hard faces round the bed in
 the vast majority of cases there was no trial no report of the arrest people simply disappeared always during the night your
 name was removed from the register every record of everything you had ever done was wiped out your one time existence
 was denied and then forgotten you were abolished annihilated vaporized was the usual word over and over again filli-
 ng half a page down with big brother he could do nothing but feeling at wing of panic it was absurd since the writing of those part-
 icular words was not more dangerous than the initial act of opening the diary but for a moment he was tempted to tear out
 the spoiled pages and abandon the enterprise altogether but it had also been suggested by the book that he had just taken
 out of the drawer it was a peculiarly beautiful book it was smooth cream paper a little yellowed by age was of a kind that had
 not been manufactured for at least forty years past he could guess however that the book was much older than that he had
 seen it lying in the window of a frowsy little junk shop in a slummy quarter of the town just what quarter he did not now re-
 member and had been stricken immediately by an overwhelming desire to possess it party members were supposed not to
 go into ordinary shops dealing on the free market it was called but the rule was not strictly kept because there were variou-

things such as shoelaces and razor blades which it was impossible to get hold of in any other way he had given a quick glance up and down the street and then had slipped inside and bought the book for two dollars fifty at the time he was not conscious of wanting it for any particular purpose he had carried it guiltily home in his briefcase even with nothing written in it it was a compromising possession it was even possible at moments to switch on his hatred this way or that by a voluntary act suddenly by the sort of violent effort with which one wrenches one's head away from the pillow in a nightmare Winston succeeded in transferring his hatred from the face on the screen to the dark haired girl behind him vivid beautiful hallucinations flashed through his mind he would flog her to death with a rubber truncheon he would tie her naked to a stake and shoot her full of arrows like saint Sebastian he would ravish her and cut her throat at the moment of climax better than before moreover he realized why it was that he hated her he hated her because she was young and pretty and sexless because he wanted to go to bed with her and would never do so because round her sweet supple waist which seemed to ask you to encircle it with your arm there was only the odious scarlet sash aggressive symbol of chastity she sat back as sense of complete helplessness had descended upon him to begin with he did not know with any certainty that this was it must be round about that date since he was fairly sure that his age was thirty-nine and he believed that he had been born in or but it was never possible now a day to stop in any date within a year or two down with big brother