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Marthe Vogt was one of the leading neuroscientists of the twentieth century, with her research career spanning more than 50 years. Marthe's legacy cannot be judged only by what she was able to accomplish herself but by the impetus she gave to all those who followed to revolutionize the treatment of mental illness.

THE EARLY YEARS

Marthe Louise Vogt, the elder daughter of Oskar and Cecile Vogt, was born in Berlin on 8 September 1903. Her mother, Cecile (*née* Mugnier) was French, from Annecy in the Haute Savoie, and her father, Oskar, from Husum in Schleswig, was of German–Danish extraction and descended from a long line of Lutheran ministers, sea captains and a pirate. Marthe Vogt had a younger sister, Marguerite, who became a geneticist. Cecile and Oskar Vogt were the leading neuroanatomists of their day (Haymaker & Schiller 1970, pp. 384–388) and from 1898 to 1937 worked jointly in Berlin on the anatomy, physiology and pathology of the brain. They described the Vogt–Vogt syndrome, and Oskar Vogt, when asked to perform a post-mortem examination of Lenin's brain, found unusually large cortical pyramidal cells, suggesting that this might indicate superior mental function. Thus Marthe grew up in a talented family where intellectual curiosity was a major driving force. As a young girl she accompanied her father on expeditions to collect insects, which he used as material for the study of genetic variability. There seems to have been little interest in politics in the home and, in spite of World War 1, the outlook was always international, probably a reflection of her parental origins. Marthe was fluent in French and English as well as German.

From 1909 to 1922 Marthe Vogt attended the Auguste Viktoria-Schule at Berlin-Charlottenburg, finishing with the 'Arbitur', the entry qualification for any German university.

At school she enjoyed only physics and mathematics, and thought that other subjects were taught in a dull, slow and old-fashioned way. There were occasional interludes in which teaching in literature and philosophy brightened the syllabus, and she was enthusiastic about the activities of the Astronomy Club. She also enjoyed sport, but the opportunities for this were minimal.

Marthe Vogt's time at Berlin University is interesting for it can be seen how the future directions of her career had their origins, from both the family background and the new ideas to which she was exposed. She attended Berlin University from 1922 to 1927 and enrolled for joint studies in medicine and chemistry. Because students were allowed to arrange their timetables as they wished, she was able to attend many lectures and courses outside the strict necessity of the curriculum. For example, she attended W. Koehler's classes in experimental psychology and considered the subject as a future career. However, vacation reading put her off the subject for good because of the interminable controversies about terminology and because no two workers seemed willing to accept the other's results. It was the excellent teaching she received from W. Schlenk and F. A. Paneth (FRS 1947) that decided what she would like to do in the future: to apply chemistry to a fundamental medical problem. Marthe Vogt qualified in medicine in 1927 and spent the first half of her 'practical year' working in hospital and the second half in her father's laboratory investigating a neuro-anatomical project for her MD thesis, graduating MD (Dr.med. Berlin) on 9 May 1928 (1)*. The next two years were spent at the Kaiser-Wilhelm-Institut für Biochemie under C. Neuberg, to complete her training in organic chemistry and produce a thesis on carbohydrate metabolism. She graduated PhD (Dr.phil. Berlin) on 27 September 1929 (2, 3). There can be few, especially women, who were so well poised to make the remarkable advances in understanding neuroscience that were to occur in the next two decades.

Starting work

In October 1928 Marthe Vogt joined the unpaid staff of Professor Paul Trendelenberg, the professor of pharmacology in the University of Berlin. She recorded that this time in Trendelenberg's laboratory, until his untimely death, was crucial for her research directions, as she learned about endocrinology and experimental techniques of pharmacological analysis, and published a number of studies (4–8). The influence of British physiology and pharmacology in the laboratory was strong, particularly from Hans Gremels, who had spent some time in London, at University College. For Marthe this time remained a treasured memory throughout her life during which there was friendly cooperation with other workers such as Hans Gremels, Edith Bulbring (FRS 1958), G. Kuschinsky, Otto Kreyer and W. Knoll, all of whom remained lifelong friends.

In 1931 she moved to the Kaiser-Wilhelm-Institut für Hirnforschung in Berlin-Buch, the institute in which her father was director, initially as a research assistant and later as head of the Chemical Division. The Rockefeller Foundation had recently re-equipped the laboratories there. Here she performed electrophysiological investigations on the brain (9, 10) and investigated the distribution of drugs with central effects within different parts of the central nervous system (11–15). She records that the working conditions at the institute were excellent, but as

* Numbers in this form refer to the bibliography at the end of the text.

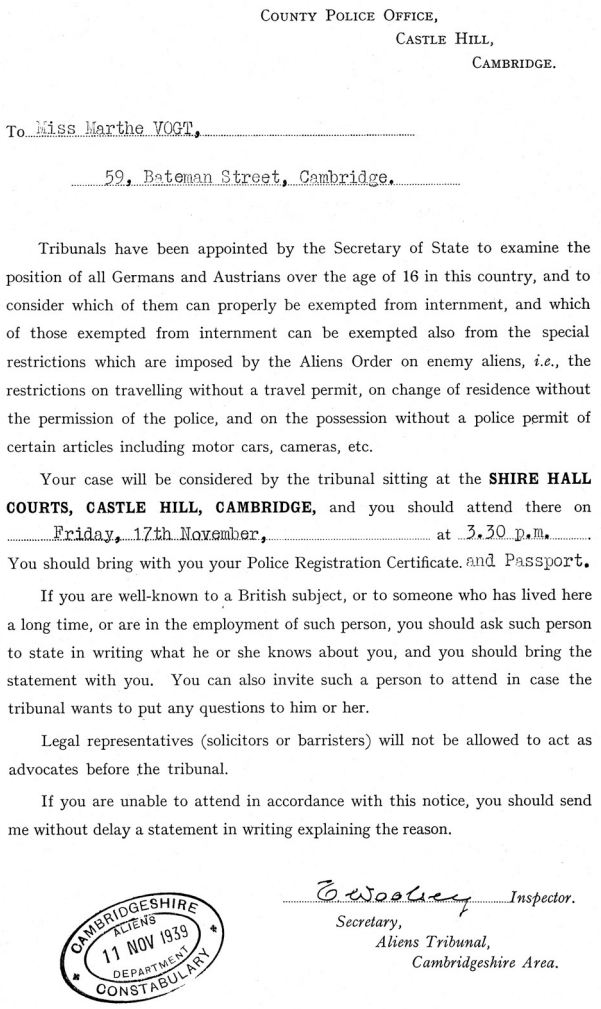
time passed the political atmosphere became oppressive and she began to seek opportunities abroad. She had not believed that the author of *Mein Kampf* could rise to power, but by this time she had been proved wrong. During a visit to the National Institute for Medical Research in London, Hampstead, she met Sir Henry Dale FRS, who offered her a place in his laboratory if she could find support. She obtained a Rockefeller Travelling Fellowship for one year and left Germany for London on 1 April 1935. It was no April Fools' Day for Marthe, who may have realized then that she would never work in Germany again.

Escape to Britain

Marthe Vogt spent the first half of her Rockefeller Travelling Fellowship in Sir Henry Dale's laboratory at Hampstead working with Wilhelm Feldberg (FRS 1947) on the release of acetylcholine from motor nerves. These must have been heady times because the idea of chemical transmission by nerves was relatively new and this work was yet a further example of principle. The work was published in the *Journal of Physiology* by Dale, Feldberg and Vogt in 1936 (16), the same year in which Dale shared the Nobel Prize with Otto Loewi (ForMemRS 1954) from Austria, for discoveries relating to chemical transmission of nerve impulses. Dale specifically mentioned the work by Feldberg and Vogt in his Nobel lecture and cautiously suggested that chemical transmission as found in the periphery might underlie interneuronal connectivity in the brain. We cannot know how this prophetic remark was to influence Vogt, for this was to be the area in which she was to make her most profound discoveries, using chemical methods to measure transmitter substances in brain. It is worth pausing to consider how difficult it was to measure acetylcholine released from the stimulation of motor nerves. Output was very small, particularly in relation to the muscle mass, and at the time the transmitter substance could be detected only by tedious bioassay. Dale and his co-workers showed not only that acetylcholine was released but that curarine, which blocked the postsynaptic effects of acetylcholine, did not affect release whereas denervation abolished it.

The second half of her fellowship was spent in Cambridge with E. B. Verney FRS, Reader in Pharmacology in the university, where they performed joint investigations on hypertension. The conditions of her fellowship were that she would return to Germany after one year, but with Verney's help she obtained a further fellowship for a year, during which she successfully applied for the Alfred Yarrow Research Fellowship at Girton College, Cambridge, giving her a further three years' support. Theoretically, then, she had sufficient support to remain in Britain until 1940.

However, as the storm clouds of war gathered there was concern about the presence of foreign nationals in the UK. Many of Marthe Vogt's Jewish friends had already fled from Germany, either to the UK or to the USA. Details of this remarkable exodus and the effects this had on science in both of these countries is given in Medawar & Pike (2000, pp. 205–207). Although not Jewish, Marthe Vogt too was part of Hitler's gift, because she had no intention of returning. At the outbreak of World War II, tribunals were set up to categorize all enemy aliens. She was summoned to appear before a tribunal in Cambridge on 17 November 1939 for her case to be considered (figure 1). In their subsequent investigations the intelligence services discovered she was still a member of the German Workers' Front, because technically Marthe still had a permanent appointment in Germany and automatically was a member. Her attempt to resign had not been accepted by the Nazi officials. Consequently she was classified



COUNTY POLICE OFFICE,
CASTLE HILL,
CAMBRIDGE.

To Miss Marthe VOGT,

59, Bateman Street, Cambridge.

Tribunals have been appointed by the Secretary of State to examine the position of all Germans and Austrians over the age of 16 in this country, and to consider which of them can properly be exempted from internment, and which of those exempted from internment can be exempted also from the special restrictions which are imposed by the Aliens Order on enemy aliens, *i.e.*, the restrictions on travelling without a travel permit, on change of residence without the permission of the police, and on the possession without a police permit of certain articles including motor cars, cameras, etc.

Your case will be considered by the tribunal sitting at the **SHIRE HALL COURTS, CASTLE HILL, CAMBRIDGE,** and you should attend there on Friday, 17th November, at 3.30 p.m. You should bring with you your Police Registration Certificate. and Passport.

If you are well-known to a British subject, or to someone who has lived here a long time, or are in the employment of such person, you should ask such person to state in writing what he or she knows about you, and you should bring the statement with you. You can also invite such a person to attend in case the tribunal wants to put any questions to him or her.

Legal representatives (solicitors or barristers) will not be allowed to act as advocates before the tribunal.

If you are unable to attend in accordance with this notice, you should send me without delay a statement in writing explaining the reason.

CAMBRIDGESHIRE ALIENS 11 NOV 1939 DEPARTMENT CONSTABULARY

E Woolley *Inspector.*

Secretary,
Aliens Tribunal,
Cambridgeshire Area.

Figure 1. Cambridgeshire constabulary documentation, 1939.

as a category A enemy alien, requiring immediate internment, and was summoned to appear again on 19 December 1939. The judge found against her and she was taken from the tribunal to the police station *en route* for Holloway gaol. On the way to the station, apparently, a kindly policeman informed her that she could appeal. Verney went to see Sir Henry Dale in London, who telephoned the Home Secretary to obtain a postponement. She was given a short time to find legal representatives and rally any support she could find from prominent persons, and was allowed to return to 59 Bateman Street in Cambridge. Marthe spent the next days writing to friends to seek support and clearly there must have been some confusion. Existing files contain a letter in support, posted to Marthe in Holloway gaol on 23 December. This was 'returned to sender' and subsequently posted on to Marthe, at Bateman Street, by 29 December 1939. By 2 January 1940 an impressive array of supporting documents had been assembled and submitted to the Under Secretary of State at the Home Office. In all, 28 individual

recommendations in support of the appeal against the Order for Internment, including those from F. H. A. Marshall FRS, Mary Pickford (FRS 1966), W. Feldberg, J. H. Burn (FRS 1942), E. B. Verney, Edith Bulbring, H. H. Dale, H. Blaschko (FRS 1962), Dorothy Needham (FRS 1948) and E. D. Adrian FRS, were submitted. It is not entirely clear at what date recategorization as a friendly alien was granted to Marthe. Letters of congratulation upon her new status appear in early February 1940 and her solicitor's bill (£36 7s. 6d.) for correspondence with the Under Secretary of State and attending him with the appeal is dated March 1940. Marthe applied to become naturalized right away, but this was not granted until March 1947, after the war had ended. Henry Dale in his support for her naturalization said 'There is nobody, among those who have come to this country in recent years, whom I would more gladly welcome as a fellow Briton'. In all, Marthe spent five productive years in Cambridge producing a series of papers with Verney, mainly on aspects of hypertension (17–22) and writing up part of this work for a Cambridge PhD in pharmacology (1938).

Although Marthe Vogt's time in Cambridge was important in establishing her position in Britain, she had not been able to establish a research niche of her own. As her time as a research fellow at Girton came to an end an opportunity arose in which she would be able to conduct independent work. In June 1941 Marthe was appointed as a member of staff at the Pharmacological Laboratories of the Pharmaceutical Society of Great Britain at Bloomsbury Square in London, commonly known as 'The Square'.

The suprarenal gland

'The Square' was one of the hotbeds of pharmacological science in the late 1930s and remains so today, although it has now moved to much larger premises in Brunswick Square. At the time there were relatively few university departments or institutions devoted to the subject. Professor J. H. Burn had left 'The Square' to take up the chair of Pharmacology at Oxford University in 1937 and had been replaced by J. H. (later Sir John) Gaddum (FRS 1945). It should be remembered that Britain was still in the early stages of the war. Important work was performed at 'The Square' in relation to new medicines that were to be included in the *British Pharmacopoeia*, standards were set, assays devised for their measurement and their properties investigated in exhaustive ways. Because of the Blitz the Pharmacological Laboratories were temporarily housed in Agricultural Research Council facilities in Reading, a far safer location than central London.

It was in this environment that Marthe Vogt found herself in mid-1941. She focused her attention on the adrenal, and its relation to stress. It was a good choice and the subject was a major, but not dominant, research interest for the rest of her career. A glance at her list of publications reveals that she published in excess of 30 papers on the subject, mostly with single authorship, representing a colossal amount of research effort. She had first been attracted to endocrinology during the time she spent in Trendelenberg's laboratory in Berlin. It was known that the release of hormones from the adrenal cortex was vital in adaptation responses to stress by trauma, disease or surgery and therefore it was important to understand how release was controlled. It is perhaps necessary to remind oneself that at this time the nature of the admixture of steroids that comprised the cortical hormones was only incompletely known, and furthermore they could be detected only by an extremely difficult bioassay, namely the prolongation of survival time in stressed adrenalectomized rats. Even so, the amount of cortical

hormone release could not be measured in absolute terms but only by comparison with a known standard extract. The only treatment for patients with Addison's disease at the time was by injection of extracts of the adrenal glands of cattle. Thus there was a real necessity to produce standard extracts against which every new batch of pharmaceutical preparations had to be compared.

By collecting the venous effluent from the suprarenal glands, followed by bioassay, Vogt was able to determine the daily output of cortical hormones from five mammalian species (23). This work was of great significance because it showed that the daily output is huge compared with the gland content. In other words the gland continually synthesized and secreted the biologically active steroids but did not store them. Subsequently she showed (24) that when adrenaline was given in concentrations naturally occurring in blood there was an increase in release, whereas stimulation of the nerve supply to the adrenal had no effect on basal output. However, prolonged stimulation of the splanchnic nerves raised cortical secretion that long outlasted the vascular effects. The difficult bioassay referred to above had led others to search for easier, more rapid ways to address adrenal function. Hypertrophy of the gland could be used for prolonged experiments, and the determination of adrenal lipids, ascorbic acid or cholesterol content of glands could be used for short ones. Although Vogt embraced these methods in her work she pointed out that only bioassay gave a quantitative measure of hormone production (30), especially as she could not detect a correlation between cortical hormone and the ascorbic acid content of the venous effluent from adrenal glands (27). She did consider that the depletion of adrenal ascorbic acid was an index of cortical activity (33). She also showed that chronic administration of adrenaline, over several days, both increased gland size and altered lipid distribution (25). Furthermore, various forms of stress, such as exposure to high or low temperature, blood loss or insulin shock, caused lipid loss from the gland (26), all signs of increased hormone release. Indeed, it was only necessary to place a rat in an unusual environment to produce a 60% reduction in adrenal ascorbic acid content in 1 hour, but if the procedure was repeated the effect was lost. The effects of these mild forms of stress were only partly eliminated if the adrenal medullas had first been removed (34), thus showing that release of adrenaline from the gland was not the only way in which stress-induced cortical hormone release was triggered. Vogt had already shown with Mary Pickford (31) that adrenaline infusions in hypophysectomized animals did not cause extra hormone release from the adrenal, although basal release was unaffected. Thus the stress response surviving in demedullated animals must be mediated by different effects on the pituitary gland, as was shown in experiments in which afferent stimulation to the central nervous system caused adrenal hormone release (35). Using the isolated perfused adrenal gland Vogt was able to show the direct effect of the pituitary hormone adrenocorticotrophic hormone (ACTH; now called corticotropin), an effect that she showed to be almost instantaneous (32). Later, through the use of micromethods to measure corticosterone chemically in single glands, she returned to the effects of hexoestrol on adrenal glands (38). The hypertrophy and hyperplasia of the cortex, together with the disappearance of lipids caused by hexoestrol, was an indicator of reduced secretion. She suggested that this was due to a failure of cholesterol synthesis and showed that it could be restored by replacement with normal plasma from untreated control animals (44). In a further study she showed conclusively that the lipid content of the adrenal cortex indicated the potential for corticosterone release (43). All of Marthe Vogt's studies on the adrenal cortex were very carefully controlled and the conclusions were tightly argued; where there was doubt, possible alternatives were investigated, and if the matter was

unresolved she said so. She displayed a deep curiosity about the functions of the gland and when she came across something unusual she explored it. For example, the guinea pig has very large adrenal glands for its size, so she looked into the matter. It turned out that in this species the gland was rather inefficient and hence needed to be oversized (48).

Neuropharmacology

Marthe Vogt's adrenal studies remained a serious interest long after she moved on from 'The Square'. In January 1947 she had moved to the Department of Pharmacology at Edinburgh as a lecturer and took a brief sabbatical spell from February to May in 1949 as a visiting associate professor at the Department of Pharmacology at Columbia University in New York. She was elevated to a senior lectureship in October 1951, and to a readership in October 1952, the year in which she had been elected a Fellow of the Royal Society, a distinction awarded previously to only eight other women. In 1960, she made her last move to the Agricultural Research Council's Institute of Animal Physiology at Babraham, just outside Cambridge, where she was Head of the Pharmacology Unit until 1968. Although she officially retired at this time she continued to publish and to receive visiting workers into the 1980s.

However, there can be no doubt that Marthe Vogt's most important contributions were as a neuropharmacologist. Even before she had left 'The Square' she had collaborated with her old friend Wilhelm Feldberg, who had by then moved on to Cambridge. They decided to look at acetylcholine synthesis in different brain regions (28). By measuring choline acetylase (now called choline acetyltransferase), the enzyme that synthesizes acetylcholine and which can be detected in small volumes of brain tissue, they provided strong presumptive evidence that acetylcholine was a transmitter in the central nervous system. The choice of choline acetylase was a wise one, because cholinesterase, the enzyme that destroys acetylcholine, is a much more dubious marker of cholinergic transmission. They were also in a position to suggest that presumed cholinergic tracts made synaptic connections with other tracts that used different chemical transmitters. Vogt had made a further collaborative study with John Gaddum and W. S. (now Sir Stanley) Peart (FRS 1969) before leaving 'The Square' (29), which in retrospect seems significant, namely to measure the concentration of adrenaline and allied substances in the blood. To do this a set of eight bioassays was established, in which closely chemically allied sympathomimetic amines could be distinguished from each other by parallel quantitative assays. This allowed adrenaline to be measured separately from noradrenaline.

While in Edinburgh, Vogt had published a paper on the concentration of sympathin (noradrenaline and adrenaline) in the central nervous system (36) that many consider is her finest piece of work. Armed now with chromatographic separation techniques, fluorimetric methods and a set of bioassays she analysed the noradrenaline and adrenaline content in the brain. It has to be remembered that the concentration of these substances is only around 1 $\mu g\, g^{-1}$ in the richest areas and in many it is a good deal less. Furthermore, she was working with samples of 10–250 mg in size. In a remarkable set of tables she gives values for the content of 41 different brain areas. It was clear that the distribution of noradrenaline was not simply due to the presence of sympathetic vasomotor nerves. The distribution was uneven, some areas having 20 times the concentration of others. There was a correlation between the content and the central representation of sympathetic function and, furthermore, the content in some areas could be modified by the administration of drugs with central activities. The data made a case for a

specialized functional role for sympathin in the brain that is distinct from actions at vasomotor nerve endings. In an extremely cautious sentence she wrote, 'It might be tempting to assign to the cerebral sympathin a transmitter role like that which we assign to the sympathin found in sympathetic ganglia and their post-ganglionic fibres'. She continued, 'There are, however, a number of facts which call for caution', and proceeded to spell these out. I am sure that most readers at the time realized she was correct, as indeed subsequent events have shown. The importance of this work cannot be overestimated and 50 years later we have a plethora of chemical substances found in the brain for which transmitter functions have been ascribed, often with considerably less evidence than she had produced at that time. Another reason for its importance is that it heralded the studies of drugs that could modify, release, potentiate or inhibit the actions of transmitter substances within the brain, crucially important for the treatment of schizophrenia, depression and Parkinson's and Alzheimer's diseases. The study of brain sympathin was a solo effort in which, at last, Vogt was able to use her chemical expertise and apply this to a neuroanatomical problem of medical importance. This approach had probably been in her mind for a long time, influenced not only by her family background but also by those initial studies she had made with Feldberg and Dale in Hampstead in 1935.

In some ways the work on sympathin became a model for future studies. With Juorio she examined the distribution of dopamine, on this occasion in the avian brain (49), where dopamine was highly concentrated in a region homologous to the mammalian corpus striatum. In more ambitious studies she moved on to measuring the release of putative transmitters and the changes in release patterns caused by various drugs or physiological stimuli of one kind or another. These were exceedingly important because of their relevance to brain mechanisms and function and because of the possibility of modifying these by drugs when they were unbalanced. To this end the release of dopamine, its metabolite homovanillic acid, acetylcholine and serotonin from the caudate nucleus were measured (50, 51). The release of dopamine (and homovanillic acid) was increased when the substantia nigra was stimulated, providing evidence for a dopaminergic nigrostriatal pathway. This work complemented earlier work in which dihydroxyphenylalanine (DOPA) had been infused (47). DOPA is a precursor for noradrenaline and adrenaline (sympathin), a synthesis that proceeds via dopamine. It was found that infusing DOPA into the brain led to an increase in the dopamine content of some areas, particularly the caudate nucleus, without increasing noradrenaline content. Associated with this was increased electrical activity that was consistent with arousal. This result was part of the story that dopamine itself is a neurotransmitter in some parts of the brain, the lack of which gives rise to Parkinson's disease; indeed, the first treatment for this disease was to give DOPA to patients.

While still at Edinburgh, Vogt had turned her attention to other brain substances with possible transmitter actions, for example Substance P and serotonin. She found that the concentration of the latter could be reduced by amphetamine and reserpine (39). Reserpine also reduced the sympathin concentration in the brain (40) and the sedation it caused was antagonized by LSD and morphine (41). Reserpine also lowered the ACTH content of the pituitary gland (45). In a review (42) she wrote, 'the view that some hypothalamic sympathin is transmitting impulses to the pituitary gland is compatible with the facts relating to the distribution of sympathin, it is not specifically supported by them'. As always ever cautious, she was keen to connect her earlier work on the adrenal gland with her studies on the brain, since after all both sets of studies were related to stress phenomena. She also investigated chlorpromazine (37), one of the early drugs used to treat schizophrenia. Reserpine and chlorpromazine were

effective in reducing mania but were not very specific and had multiple actions and are now obsolete; since that time the drive has been to discover compounds that act more specifically. Vogt examined the actions of methoserpidine, a reserpine derivative, but found that although it reduced sympathin concentration in the periphery it was without central effect (46).

She continued to work on serotonin while at Babraham, showing that it acted as a transmitter of impulses to neurons of the linear nuclei terminating in the caudate nucleus and septum (52). A further study showed that the release of serotonin into the third ventricle was enhanced in the presence of chlorimipramine, indicating the presence of a powerful reuptake mechanism for released serotonin (53). The presence of a reuptake mechanism, of course, diminishes the effectiveness of the released serotonin but effectiveness can be increased by the use of uptake inhibitors. Many modern antidepressants use this principle, of which Prozac is an example. Always curious to explore possible central connections Vogt showed, with Fukui, that visual stimuli increased serotonin turnover in the superior colliculi (55). Although she performed many drug studies, the analgesic effects of morphine held a particular fascination. Using dihydroxytryptamine to decrease brain serotonin content, she showed that the analgesic activity of morphine was attenuated, suggesting that serotonergic neurons were involved (54). Morphine also increased serotonin turnover in brain but not in a simple way related to the density of serotonergic nerves. She found eight sites in particular where the effect was pronounced, which corresponded to the sites where endogenous endorphins—the precursors of encephalins, nature's analgesics—were found (56).

As her research career drew to a close, Marthe Vogt's studies became increasingly pharmacological as she probed ways of modifying the actions of central transmitter substances in meaningful ways. At the time, the armoury of drugs available to treat diseases caused by transmitter imbalance within the brain was relatively modest, and few of those she investigated will be found in today's pharmacopoeias. The study of brain neurochemistry became an industry, and today the treatment of mental disorder and dementia by drugs has benefited untold numbers of patients. Marthe Vogt was a pioneer of this movement.

After she had moved to Babraham in 1960 there continued to be a stream of visiting scientists to Marthe's laboratory. However, particular mention must be made of Dennis Sharman and Marguerite Holzbauer, who were her loyal and devoted collaborators for the whole of the Babraham period and had accompanied her from Edinburgh. Apart from brief interludes as a visiting professor in Sydney in 1965 and Montreal in 1968, Marthe continued to work at Babraham long after retirement.

Not unexpectedly, Marthe was in great demand as a writer of reviews as the variety and complexity of chemical transmission in the central nervous system became apparent; equally frequent were the invitations to give plenary lectures at international conferences, details of which can be found in her publication list. Her complete *oeuvre* reveals an extraordinary finding: one-third of her total publications appeared after retirement, of which over half were original research papers.

Of other things

Marthe Vogt's life was dominated by her work; it was her passion and there was little time for other things. Her home in Marion Close in Cambridge, where she lived while at Babraham, was packed with books and scientific journals that she felt she needed to hand. She was,

however, an enthusiastic gardener. Visitors to her home could not escape a garden tour and she had a special affection for roses. In the house a giant *Monstera* climbed the sitting room wall and across the ceiling, much to Marthe's joy. Marthe had a somewhat severe appearance and was not one for idle chatter. However, behind this façade was one of the kindest, caring persons one was ever likely to meet. She was a great letter writer and kept many of the replies, neatly filed by year. They reveal the innumerable kindnesses she had shown to others. When Marthe first came to England in 1935 she had helped refugees from Franco's oppression in Spain, as well as German Jews, to become established in Britain. Her compassion for those whose lives were blighted by war is evidenced by her membership of anti-nuclear organizations and her subscription to campaigns for prisoners of conscience. Throughout her career she was much sought after as an external examiner for PhD candidates. One such candidate who had delivered a rather thin thesis, both in size and content, had spent the afternoon being questioned by Marthe. As evening approached it is reported that Marthe said, 'Well Mr. ——, it has been a long session; we will start again tomorrow at 9.30 a.m.'. After a long morning session he was eventually awarded his doctorate, presumably by the narrowest of margins. She had really done the candidate a great service and he was smart enough to realize that his future lay elsewhere than in research. He was a successful and wealthy businessman within a few years. Other candidates have written (Bindman *et al.* 1993, pp. 49–59) how Marthe would unfold page after page of questions probing every aspect of the work. Rigor and precision were the hallmarks of everything she did, but it was always done with kindness and encouragement. On another occasion, at a meeting of the British Pharmacological Society, the session had gone on rather late. As the delegates flooded out from the lecture theatre they moved *en masse* to a local hostelry for refreshment, Marthe along with them. Finding herself in a dive, the like of which must have come as a terrible shock, she approached two graduate students and kindly asked that she be escorted from this place. At subsequent meetings she would seek them out and ask how their work was progressing.

Marthe Vogt was accorded many honours, including an honorary DSc from Edinburgh University (1974) and from Cambridge University (1983) and the Royal Medal from the Royal Society in 1981. She was an honorary member of the American Academy of Arts and Sciences (1977), the Royal Society of Medicine (1980), the Deutsche Physiologische Gesellschaft (1976), the Académie Royale de Médicine de Belgique, the Physiological Society (1974), the British Pharmacological Society (1971), the Hungarian Academy of Sciences (1981) and the British Association for Psychopharmacology (1983). The British Pharmacological Society awarded her the Wellcome Gold Medal in 1983. Girton College, the institution at which she was a graduate student in the late 1930s, made her a Life Fellow in 1970. It was a place in which she made many friends, and the college became a focus of her social life. Marthe never lost her enthusiasm for science and was reluctant to give up experimental work, even when increasing frailty and impaired vision made this difficult. The last publication listed in her papers is dated 1984, with M. Vasco and I. H. Pang in *Brain Research* (57), and showed that morphine had actions at both supraspinal and spinal levels. She was 81 years old at the time. However, Professor Christopher Bell pointed out to me that a further paper appeared in 1988 (58), four years after she stopped regular publication. It was co-authored with R. J. Baldessarini, who had worked with her at Babraham in the 1970s, and comes from the Department of Psychiatry at Harvard. Eventually, in 1988, she left her adopted country to live with her sister Marguerite, 10 years her junior, in La Jolla, California. Marthe Vogt died on 9 September 2003, the day after her 100th birthday.

Acknowledgements

I am extremely grateful to Dr Ann Silver, of the Physiological Laboratory at Cambridge, who so often pointed me in the correct direction, and to Dr Marguerite Vogt for allowing me access to some of her sister's papers. Amanda Engineer, archivist at the Wellcome Trust, kindly located for me a complete list of Marthe Vogt's publications for the period 1968–84. To Sir Arnold Burgen FRS and Professor Christopher Bell I am indebted for their careful reading of the draft manuscript.

The frontispiece photograph was taken in 1930 and is reproduced by courtesy of the author.

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