

Neuroscience in Nazi Europe Part II: Resistance against the Third Reich

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ABSTRACT: Previously, I mentioned that not all neuroscientists collaborated with the Nazis, who from 1933 to 1945 tried to eliminate neurologic and psychiatric disease from the gene pool. Oskar and Cécile Vogt openly resisted and courageously protested against the Nazi regime and its policies, and have been discussed previously in the neurology literature. Here I discuss Alexander Mitscherlich, Haakon Saethre, Walther Spielmeier, Jules Tinel, and Johannes Pompe. Other neuroscientists had ambivalent roles, including Hans Creutzfeldt, who has been discussed previously. Here, I discuss Max Nonne, Karl Bonhoeffer, and Oswald Bumke. The neuroscientists who resisted had different backgrounds and motivations that likely influenced their behavior, but this group undoubtedly saved lives of colleagues, friends, and patients, or at least prevented forced sterilizations. By recognizing and understanding the actions of these heroes of neuroscience, we pay homage and realize how ethics and morals do not need to be compromised even in dark times.

RÉSUMÉ: *Neuroscience en Europe sous domination nazie, 2e partie : résistance contre le Troisième Reich.* J'ai mentionné antérieurement que tous les neuroscientifiques n'avaient pas collaboré avec les nazis qui, de 1933 à 1945, ont tenté d'éliminer la maladie neurologique et psychiatrique du patrimoine génétique. Oskar et Cécile Vogt se sont opposés ouvertement et ont protesté courageusement contre le régime nazi et ses politiques. Ce sujet a déjà été exposé dans la littérature neurologique. Je discute ici d'Alexander Mitscherlich, de Haakon Saethre, de Walther Spielmeier, de Jules Tinel et de Johannes Pompe. D'autres neuroscientifiques ont tenu des rôles ambivaux, entre autres Hans Creutzfeldt dont il a été question antérieurement. Je discute ici de Max Nonne, de Karl Bonhoeffer et d'Oswald Bumke. Les neuroscientifiques qui ont résisté provenaient de milieux différents et résistaient pour des motifs différents, ce qui a vraisemblablement influencé leur comportement. Cependant, ce groupe de neuroscientifiques a sans aucun doute sauvé la vie de collègues, d'amis et de patients ou du moins a prévenu des stérilisations forcées. Par la reconnaissance et la compréhension des actions de ces héros de la neuroscience, nous leur rendons hommage et nous reconnaissons que l'éthique et la morale ne doivent pas être compromises, même dans les moments sombres de l'histoire.

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In a previous paper,¹ I discussed the Nazi "racial hygiene" theories that led to the sterilization law of 1933 in Germany, resulting in approximately 400,000 sterilizations of neurologic and psychiatric patients with "congenital feeble-mindedness," schizophrenia, hereditary epilepsy, bipolar disorder, Huntington's disease, major brain malformations, congenital blindness, congenital severe hearing loss, chronic alcoholism, pre-senile and senile dementia, encephalitis, poliomyelitis, "therapy-resistant paralysis," multiple sclerosis, and Parkinson's disease.²⁻⁵ Because of strong desire to permanently rid the population of these "useless eaters," the Nazi "euthanasia"

programs were enacted from 1939-1945 resulting in about 275,000 murders of the same patient population.²⁻⁵ It has been written by many historians that the main Nazi motivations to murder these patients were economic costs and the freeing up of hospital space for soldiers from the war front, but Nazi leader Adolf Hitler's main concern was probably racial hygiene.⁶ He rejected an offer from two Catholic bishops to take over the costs of taking care of patients, suggesting against an economic explanation for euthanasia.⁶ In the previous paper¹ I mainly discussed several neuroscientists^a who were collaborators with the Nazi euthanasia programs, but also mentioned some

^aThe term *neuroscientists* is a more modern term used here for expediency to describe the combination of neuropathologists, clinical neurologists, and neuropsychiatrists discussed in this paper, though the term didn't exist in the 1930's and 40's.

neuroscientists who were forced to flee Nazi Europe, some who were victims of the Nazis, and some who actively resisted and protested against the Nazis. In this paper, the focus is on the latter group, and I address the motivations and explanations of these courageous neuroscientists.

Much of the German medical community in the Nazi era eagerly cooperated with the Nazis, and resistance was typically isolated and rare.⁷ In the atmosphere of German medicine in the 1930's, there was even competition for sterilization quota to be attained.⁸ Though an estimated 350 doctors committed medical crimes, this may have been only the tip of the iceberg and underestimates a vast wave of criminality. Numerous other doctors were guilty of slander and ostracism of their Jewish colleagues, and propagation of vulgar Nazi racist policies.⁹ Most doctors simply silently cooperated with the Nazi policies, and many must have agreed with the psychoanalyst Carl Jung who said sarcastically early in the Nazi regime that resistance was "like protesting against an avalanche."⁷ However, of the many Germans who did resist, physicians were important. Resistance ranged from opposition to the dismissal of Jewish colleagues from university posts and medical clinics, to helping provide Jews with foreign passports and Aryan identity certificates, to passing sensitive information to resistance fighters, supplying medicine and radio parts to resistance fighters in the concentration camps, to open and private criticism of Nazi policies and racial theories.⁷ Medical students were involved in Nazi indoctrination as well, being told they should aspire to the "synthesis of the marching boot and the book," and become "biological soldiers" of the Nazi state. Medical students did resist, however, and the White Rose resistance group at the University of Munich, which had five medical students and a few others was a prime example.⁹ Between 1942 and 1943, the group issued leaflets denouncing Hitler and calling for the people to overthrow the Nazis. The leaflets stated "We will not be silent. We are your bad conscience. The White Rose will give you no rest." Four of the students were condemned by a "people's court" and executed by beheading.

Much resistance to the Nazi euthanasia program came not from the medical profession but from the churches. Most clergy leaders either went along with the Nazis or did nothing.¹⁰ But Protestant Pastor Fritz von Bodelschwingh, director of the Bethel Institution at Bielefeld, which mainly housed and cared for epileptic patients, was part of a group within his church which advocated fighting against the euthanasia program. Silent resistance at Bethel consisted of sabotage of required patient questionnaires (that identified patients to be euthanized) and maneuvers to keep patients from transfer to the killing facilities. Bodelschwingh had a letter delivered to Hermann Göring (Nazi head of the Luftwaffe, the German Air Force) in 1941 asking that the epileptics be spared from "economic planning" measures.¹⁰ He partially cooperated with Nazis but managed to stall the process of selection and transfer of the patients to killing centers, and managed to save most of his patients. The strongest Catholic protest came from the bishop of Münster, Clemens Count von Galen. In August, 1941 he gave a sermon condemning the Nazis for opposing the "will of God" by killing innocent mental patients and authorizing "the violent death of invalids and elderly people." He went on to warn of a slippery slope in which any who are weak or sick, including wounded soldiers may not be "certain of his life." He warned that the Nazi "blasphemy of

our faith" and "ungodly behavior" would be punished by divine retribution. Copies of his sermon were dropped by the British on German troops as propaganda. Von Galen was not imprisoned for fear of making him a martyr and the Nazi desire to maintain good public opinion of the regime. Nazi euthanasia was ended or stalled officially later that same month, although killings continued secretly through the end of the war, often by more passive measures such as starvation, instead of gassing and lethal injection.¹⁰

Among neuroscientists, the resistance of Oskar (1870-1959) and Cécile (1870-1962) Vogt has been discussed in depth previously in the neurology literature.¹¹⁻¹⁴ Husband and wife Vogt were pre-eminent neuroscientists in Germany since the beginning of the 20th century. They were involved in the discovery of the cytoarchitectonic organization of the cerebral cortex and thalamus, conducted extensive research on selective neuronal vulnerability (pathocllisis), were selected to dissect Vladimir Lenin's brain in Moscow in 1924, mapped the corpus striatum and correlated changes there with Huntington's chorea, and described Vogt-Vogt syndrome, a pediatric extrapyramidal

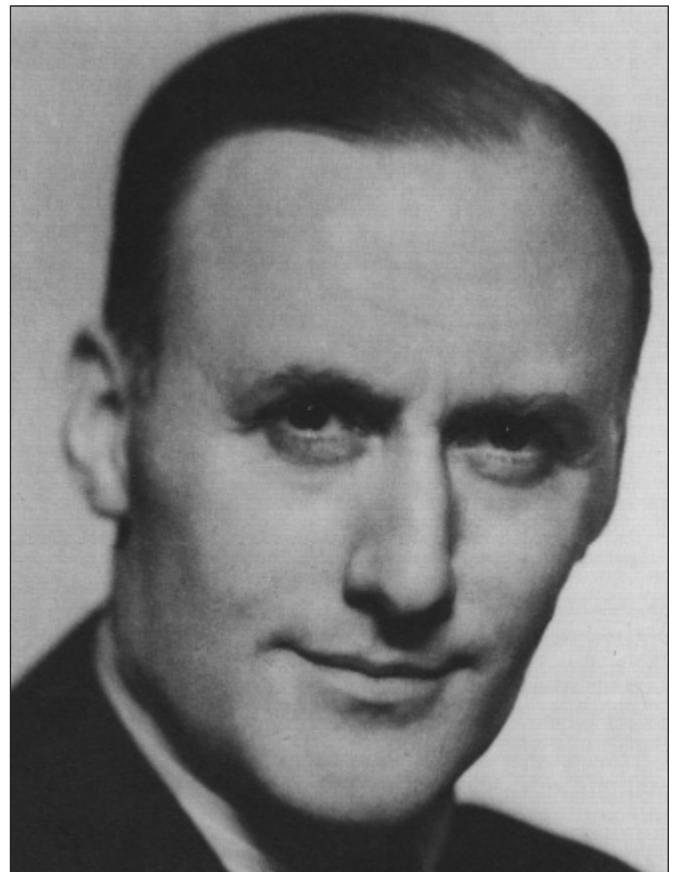


Figure 1: Haakon Saethre. Photo reprinted by permission from Peter Beighton, Emeritus Professor of Human Genetics, University of Cape Town, Cape Town, South Africa. Photo originally provided by Dr. Sigvald Refsum (1907-1991) from Norway, and published in Beighton P, Beighton G. *The person behind the syndrome*. London: Springer-Verlag; 1997.



Figure 2: Walther Spielmeyer. The Center for the History of Neuroscience, Department of Neurology and Rehabilitation, University of Illinois at Chicago, Chicago, IL USA.

disorder with bilateral athetosis.^{11,15} The Vogts openly criticized the Nazi regime and racial hygiene policies, they resisted pressure to use racial criteria instead of academic qualifications to hire staff, and Oskar reportedly pushed Nazi Propaganda Minister Joseph Goebbels down the stairs.¹² They had to endure Nazi raids on the Kaiser Wilhelm Institute for Brain Research in Berlin (KWI) which they headed until 1937 when Vogt was removed by Hitler, and replaced by Hugo Spatz.¹³ They hid Jewish friends (the Reifenberg and Calé families) from Nazi persecution, at great personal risk.¹³ After the war, in an ironic twist, Oskar sent a letter to the International Military Tribunal requesting to dissect the brains of Nazi criminals who were sentenced to death at the Nuremberg war crimes trials (this was turned down as “too hot a potato to handle”).¹³ In this paper the focus is on two neuroscientists not previously discussed in the neurology literature on this topic, Alexander Mitscherlich (1908-1982) and Haakon Saethre (1891-1945) (Figure 1), as well as others only briefly mentioned previously,¹¹⁻¹² including Walther Spielmeyer (1879-1935) (Figure 2), Jules Tinel (1879-1952) (Figure 3), and Johannes Pompe (1901-1945) (Figure 4) (Table 1).

Additionally, some neuroscientists had ambiguous roles during the Nazi era, resisting some policies but collaborating

with others (Table 2). Hans Gerhard Creutzfeldt (1885-1964) has been discussed previously in depth in the neurology literature on this topic.^{11,16} He was a well known neuropsychiatrist and neuropathologist who described Creutzfeldt-Jakob disease, the most common prion disorder. He made it clear that he disliked Nazi policies, and may have prevented the transfer of some of his patients from being murdered in the Nazi euthanasia centers, but not as many as previously thought, and he also put great effort into reversing a diagnosis of schizophrenia in a case of a German sailor who had deserted, which led to an avoidable death sentence. But Creutzfeldt's wife was imprisoned for remarks against Hitler, and his son deserted the German army and joined the resistance in Holland. In 1954, Creutzfeldt tried to blow the cover on a former infamous Nazi euthanasia doctor, Werner Heyde, who was living under an alias in Munich.^{11,16} In this paper the focus is on neuroscientists only briefly mentioned elsewhere in the neurology literature,¹¹⁻¹² including Max Nonne (1860-1959) (Figure 5), Karl Bonhoeffer (1868-1948) (Figure 6) and Oswald Bumke (1877-1950) (Figure 7).

METHODS

Names of the above scientists were obtained from various review articles and books written on the topic.^{2,6,11,12} The website

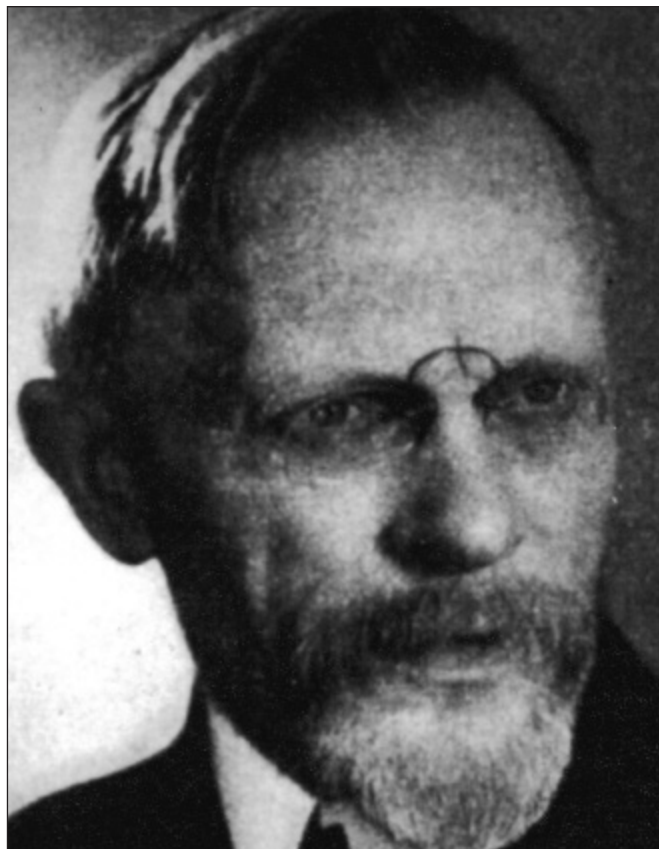


Figure 3: Jules Tinel. Originally published in *Neurosurg Focus* 2010;28(5):E24, and reprinted with permission from the American Association of Neurological Surgeons.



Figure 4: Johannes C. Pompe. Painting reprinted by permission from Peter Beighton, Emeritus Professor of Human Genetics, University of Cape Town, Cape Town, South Africa. Photo originally provided by Dr. Daniel de Moulin (1919-2002) from Holland, and published in Beighton P, Beighton G. *The man behind the syndrome*. New York: Springer-Verlag; 1986.

www.whonamedit.com was helpful in searching for additional names and references, as were the review textbooks *The man behind the syndrome*,¹⁷ *The person behind the syndrome*,¹⁸ and the *Dictionary of medical eponyms*.¹⁹

RESULTS

Alexander Mitscherlich (1908-1982) – Born into a scholarly family in Munich,²⁰⁻²¹ he studied philosophy and art history, but halted his studies and opened a bookshop when the Nazis came to power in Germany.²¹ He was blacklisted by the Nazis in 1932 for keeping “illegal literature” in his Berlin bookshop,^{21,22} and was a member of resistance leader Ernst Niekisch’s circle in Berlin.²³ Because of fear of the Gestapo (Nazi secret police) he fled to Zurich in 1935 to study medicine, and returned to Germany in 1937 to help the captured Niekisch.²³ He was arrested by the Gestapo and imprisoned in Nuremberg for eight months. He was released with the understanding that he would report to the Gestapo regularly.^{21,22} He completed his medical studies in Heidelberg and practiced neurology there, before being awarded a lectureship in 1946. He was appointed head of neurology at the University of Heidelberg after the liberation.²² He also taught internal medicine and psychotherapy. Heavily influenced by Freudian psychoanalysis, he was also involved in the new psychosomatic clinic at Heidelberg.²¹ In 1959, he

established the Sigmund Freud Institute in Frankfurt, a unique place for research, teaching, and study of psychoanalysis.²¹ Mitscherlich moved to Frankfurt in 1967 to become Chair of Psychoanalysis at Frankfurt University, and remained there and at the Freud Institute until his retirement in 1976.²¹ He participated in the creation of and was editor in chief of the psychoanalysis journal “PSYCHE,” and he published over 250 books and articles during his career. Many of these articles dealt with biological and psychological analysis of modern social phenomena using psychoanalytic principles.²¹ He was also a contributing editor of the “Israel Annals of Psychiatry” from its onset, and showed support for the state of Israel. His enthusiasm led to the renaissance of psychoanalysis in postwar Germany.²¹

Mitscherlich was head of the German Medical Commission to the Nuremberg Medical Crimes Tribunal from 1946-47.²² He was only a young lecturer at the time, and was aware that heading the Commission would mean the end of his career; no senior medical figure would take the position.²⁴ He and his medical student Fred Mielke published a comprehensive report of the trials in 1947, *Das Diktat der Menschenverachtung* (‘Science without humanity’), of which 10,000 copies were printed but it only received a few book reviews in the German press. The book received mostly hostile criticism from the medical community, with one critic writing that only “perverts” would read it.²⁵ Mitscherlich later wrote that he felt he was a victim of character assassination.⁶ He was ostracized from

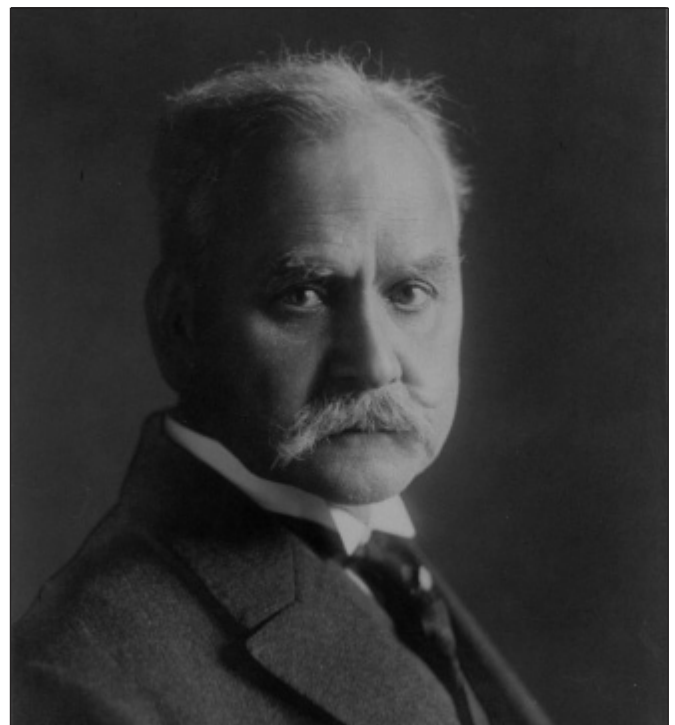


Figure 5: Max Nonne. The Center for the History of Neuroscience, Department of Neurology and Rehabilitation, University of Illinois at Chicago, Chicago, IL USA.

Table 1: Neuroscientists who openly resisted the Nazi regime in Europe

Neuroscientist	Notoriety and resistance offered
Oskar Vogt (1870-1959) Cécile Vogt (1870-1962)	Described Vogt-Vogt syndrome, pioneers in cerebral cytoarchitectonics and selective neuronal vulnerability. Hid Jewish friends from Nazi persecution, refused to follow Nazi policies, openly spoke out against the regime.
Alexander Mitscherlich (1908-1982)	Neuropsychiatrist who supported psychoanalysis and psychosomatic literature. He was jailed for anti-Nazi resistance, chronicled the Nazi doctors' trial in 1946-47, and was ostracized from profession.
Haakon Saethre (1891-1945)	Norwegian neuropsychiatrist who described Saethre-Chatzen syndrome (acrocephalosyndactyly type III), helped the Norwegian resistance against the Nazis and hid Jews from persecution, murdered as part of Nazi reprisals.
Walther Spielmeier (1879-1935)	Famous for Batten-Spielmeier-Vogt disease (juvenile neuronal ceroid lipofuscinosis, or type III). He denounced the Nazi regime and the dismissal of Jewish colleagues, and helped many neuroscientists find jobs outside of Germany.
Jules Tinel (1879-1952)	French neurologist and neuropathologist who described Tinel's sign in peripheral nerve lesions. He and his family were jailed for assisting the French resistance smuggle Allied pilots to safety, and his son died in a Nazi concentration camp.
Johannes Pompe (1901-1945)	Dutch pathologist who described Pompe syndrome (Type II glycogenosis, or acid maltase deficiency). He helped the Dutch resistance and was jailed, then executed as part of Nazi reprisals.

academic medicine for a long time, and blocked from becoming chair at any major university at that time.²⁶ Three doctors sued him for defamation of character because of inclusion of their names in his list of those who didn't protest and were accomplices to Nazi medical crimes.⁶ Ironically,^b Viktor von Weizsäcker supported and defended Mitscherlich against his accusers in a 1947 article "'Euthanasia' and Human Experiments."⁶ In 1949, Mitscherlich and Mielke's book was translated into English as *Doctors of Infamy: The story of the Nazi medical crimes*. Despite the negative press in Germany, Mitscherlich and Mielke's report was taken as evidence by the International Medical Association in its reinstatement of

Germany in the early 1950s that the German medical community was acknowledging its guilt and trying to learn from its recent past.²⁵ In 1960, an extended version, *'Medicine without humanity,'* was published in Germany.^{6,24}

Mitscherlich wrote of his motivations in a 1978 reissue of his book: "One must know the junctures, where human behavior descends to orgies of rage, humiliation, destruction of one's neighbor; and one must uncover how these points are fed by forces seemingly remote but in fact invisibly linked areas through our veins and capillary system and how it happened that from there poisonous substances seeded through in all directions."⁶ But this book may have paradoxically done the

^bVon Weizsäcker after the war was Director of the Psychosomatic Clinic at Heidelberg, and a colleague of Mitscherlich.⁶ He was a complex individual with ambiguous involvement in neuropathological studies on euthanasia victims done at Breslau Neurological Institute where he was director during the war.¹

Table 2: Neuroscientists who offered ambivalent resistance against the Nazi regime

Neuroscientist	Notoriety and ambivalent resistance offered
Hans Gerhard Creutzfeldt (1885-1964)	Described Creutzfeldt-Jakob disease and was a pre-eminent German neuropathologist/neuropsychiatrist. Saved some patients from Nazi euthanasia but let many be murdered, helped to uncover alias of former Nazi doctor Werner Heyde, but helped Nazis convict a sailor of treason resulting in his execution. His wife was arrested for anti-Nazi speech, and his son took part in the Dutch resistance.
Max Nonne (1860-1959)	Pre-eminent neurologist in Hamburg who described Nonne-Marie syndrome (adult onset cerebellar ataxia), and pioneer in neurosyphilis treatment and description of pseudotumor cerebri. Supported euthanasia for some patients, but resigned over Nazi atmosphere and derided the regime, also helped many Jewish neurologist and physician colleagues to find new homes outside of Germany.
Karl Bonhoeffer (1868-1948)	Famous neuropsychiatrist who described Bonhoeffer's reaction, or acute organic psychosis. He helped but often resisted Nazi sterilization efforts against neuropsychiatric patients, and created anti-Nazi atmosphere at his Berlin nervous disorders clinic. His two sons and son-in-law were killed by the Nazis for involvement in the resistance movement.
Oswald Bumke (1877-1950)	Internationally recognized neuropsychiatrist who published volumes on psychiatric and neurologic disorders, and was supporter of combining neurology and psychiatry clinics. May have initially supported the Nazi regime, but wrote against the utility of sterilization of epileptics and other types of neuropsychiatric patients, as well as against forced abortions for these patients. He helped some but not all patients in his Munich clinic from being murdered in Nazi euthanasia programs.

German medical community a favor by focusing on two dozen or so extraordinary fanatics from the Nazi era whose barbaric activities could be distanced from the less visible collusion of the German medical mainstream who ‘had done nothing wrong.’^{6,24} Nevertheless, Mitscherlich’s five publications dealing with medicine in the Nazi era contributed significantly to discussions in Germany and elsewhere regarding the question “How was it possible?” He emphasized intellectual humanism and increased insight and tolerance as answers to preventing a recurrence of the crimes of that era.²¹ He was awarded the German Book Trade Peace Prize in 1969.

Haakon Saethre (1891-1945) – A Norwegian neuropsychiatrist, born in Bergen, Norway in 1891, he obtained his medical degree from the University of Oslo in 1918. He trained in neurology and psychiatry and was appointed chief of psychiatry at the City of Oslo Hospital, Ullevål. He maintained a large private practice, and served as special consultant to the Oslo City Child Committee. As part of this committee, he recommended the formation of specialized child psychiatry clinics. Because of his skill at administration and his excellent clinical abilities, he was elected President of the Scandinavian Congress of Psychiatry in 1938, and represented Norway at several international meetings. He was highly regarded for being a knowledgeable and devoted doctor and teacher, being involved in community initiatives, and was honorary president of the Norwegian Society of Mental Hygiene for several years.¹⁸ Earlier in his career, Saethre investigated numerous neuropsychiatric and genetic disorders. He wrote two review articles in 1931 describing what is now known as acrocephalosyndactyly type III, or Saethre-Chotzen syndrome.¹⁸ He also studied craniostenosis, multiple sclerosis, and tabes dorsalis. His work on cerebrospinal fluid in neurosyphilis revealed correlation with defined treatment regimens, and attracted international recognition. He later focused on the neuropsychiatric effects of head injury, as well as chronic alcoholism.¹⁸

Because of his strong sense of patriotism, Saethre was strongly opposed to the Nazis and their occupation of Norway during World War II. He reportedly helped Jews to escape to Sweden, and was active in the resistance movement. He also sometimes concealed Jews as patients admitted to the hospital wards. In February, 1945, a Nazi appointed senior police official was assassinated by Norwegian resistance forces in Oslo. The Nazis then rounded up several prominent Norwegian civilians, and arrested Saethre at his hospital. He was shot the following day and cremated immediately, his ashes being thrown in the Oslo Fjord, only three months before liberation by the Allies. His posthumous painting now hangs in the psychiatry department at the City of Oslo Hospital, Ullevål.¹⁸

Walther Spielmeier (1879-1935) – Born in Dessau, Germany, he was a pre-eminent neuropathologist who made numerous contributions to understanding the pathologic basis of neurologic disorders.¹⁸ He initially contemplated a career in the Church, but decided on medicine and studied at Halle.¹⁸ He started working in neuropathology while still a medical student, by performing histopathological investigations of deceased psychotic patients.¹⁸ In 1906 he was appointed lecturer at the University of Freiburg, where he studied psychiatry.¹⁸⁻¹⁹ While continuing his histopathological work in Freiburg, he showed in 1908 that disturbed lipid metabolism had caused macular and nervous tissue infiltration with a fatty substance in a child who

had died from “amaurotic familial idiocy.”¹⁸ Spielmeier was first to recognize this underlying pathological abnormality in these familial disorders, in which progressive visual and intellectual deterioration are the main facets.¹⁸ The eponym Spielmeier-Vogt disease, or Batten disease, describes what is now referred to as neuronal ceroid lipofuscinosis type III, a more specific term based on the biochemical defect which was later discovered. This juvenile form of amaurotic familial idiocy is to be distinguished from the late infantile type (Jansky-Bielschowsky disease), and the adult form (Kufs disease).¹⁸

Because of his budding reputation, Spielmeier was recruited to Munich to become director of the new German Research Institute of Psychiatry in 1917, and Honorary Professor in 1918. He wrote several important monographs on peripheral nerve injuries during World War I.¹⁸⁻¹⁹ He became increasingly interested in neuronal dysfunction from transient circulatory abnormalities,¹⁸⁻¹⁹ though he was opposed to Oskar and Cécile Vogt’s ideas on pathocllisis.²⁷ Spielmeier believed the selective vulnerability of certain neuroanatomical regions such as the Sommer (CA1) sector of the hippocampus was related to specific vascularization in those areas, and had nothing to do with pathocllisis. Because of his prestige, and support from the many alumni of the Munich school, the pathocllisis theory was largely rejected at that time.²⁷ Spielmeier wrote an important and first textbook on nervous system histopathology in 1922, and in 1928 he became director of histopathology at the new Kaiser Wilhelm Institute, which was funded by the Rockefeller Foundation.¹⁸⁻¹⁹ He remained in Munich until his death in 1935 from complications related to tuberculosis,¹⁸⁻¹⁹ and was succeeded by Willibald Scholz as head of the German Research Institute, which would later become involved in research using brains from victims of the Nazi euthanasia program.^{1,28}

Spielmeier was a perfectionist, was very sarcastic of unscientifically founded hypotheses, and was very outspoken against pompousness.¹⁸⁻¹⁹ He openly denounced the Nazi regime, which brought him into great personal danger.¹⁸⁻¹⁹ He tried to prevent the dismissal of Jewish colleague Karl Neüberger, head of a scientific subdivision of the Histopathologic Department of the German Research Institute that was housed at Eglfing-Haar mental asylum (near Munich).²⁹ In an April, 1933 letter to the director of Eglfing-Haar, Spielmeier tried to make a special case for Neüberger’s retention. He stated that Neüberger was a highly decorated World War I medical officer, had converted to Catholicism and married a Roman Catholic woman, and most importantly, his dismissal would jeopardize scientific relations with the USA, especially the Rockefeller Foundation (an important source of funding for the Institute).²⁹ Spielmeier also reportedly tried to prevent another Jewish colleague, Felix Plaut, who was head of the Serology Department at the Institute, from being dismissed.³⁰ Plaut is recognized as a pioneer of modern neuro-immunology, having written numerous papers on the pathogenesis and treatment of neurosyphilis.³¹ Despite Spielmeier’s efforts (and the efforts of Max Planck in regard to Plaut), Neüberger and Plaut were dismissed in 1935 with stricter implementation of the Nazi Civil Service Law, which forbade “non-Aryans” from working in government positions.^{30,31} Neüberger was able to re-establish himself in the USA after great efforts, and in 1966 he received the golden Kraepelin Medal in recognition of his work at the Institute.³⁰ Plaut emigrated with his family to England, and

received further support from the Rockefeller foundation to continue his research. However, he never overcame his disappointment and embitterment from his exile and dismissal at the Institute from such a prominent position, and he committed suicide in 1940, prior to his impending internment due to his German citizenship.³¹

Jules Tinel (1879-1952) – Born in Rouen, France and descended from five generations of physicians, he was highly concerned with religion in his youth. He attended a Catholic school where he organized religious pilgrimages. He completed medical studies in Rouen and then began postgraduate training in Paris with Joseph Jules Dejerine, who strongly influenced his interest in neurology and neuropathology.³²⁻³³ Tinel published an article in 1910 on regeneration in the central nervous system.³² In 1914, he was an auxiliary doctor for an infantry regiment in World War I, but in 1915 he moved to Mans, France and set up a neurology center.³³ The same year, he published *“The sign of tingling in lesions of peripheral nerves.”*³² The eponym “Tinel sign” to indicate paresthesias in the dermatome supplied by a regenerating nerve (regenerating axons) produced by stimulation of the nerve at or distal to the lesion has persisted.³²⁻³³ The Tinel sign was not associated with carpal tunnel syndrome until G.S. Phalen wrote of its diagnostic utility in 1950.³³ Also during this early stage of his career, Tinel published on such eclectic topics as *“Confession and psychiatry,”* and *“The Holy Story and Preparation of Jesus Christ,”* as well as *“Impressions of a trip to Palestine.”* He became Chief of Neurology at the Henri-Rousselle Hospital in Paris after World War I, and published significant early work on viral encephalitis, senile dementia, vascular headaches, and sympathetic pain.³² Additionally, Tinel published one of the first comprehensive accounts of the physiology of the autonomic nervous system in 1936 in his book *“The vegetative nervous system.”*³³

Tinel worked with the French resistance movement in World War II beginning in 1942,³²⁻³³ taking part in the Comète (Comet line) resistance network. He hid Allied pilots who had crashed on French soil in his house, and his son Jacques would then drive them to safety in Spain.³³ Jacques was arrested and jailed in Bordeaux, France on his return from one of these perilous missions, and then the entire Tinel family was jailed in Fresnes, France. The Comète network was destroyed by the Nazis.³³ Jules Tinel and the rest of his family were released after some months, except for Jacques who was condemned to Dora concentration camp in Nordhausen, Germany and died in 1943 from the horrible conditions there.³²⁻³³ After the war, Tinel suffered a series of strokes leaving him mute, but he still continued to conduct neuropathological research until his death from heart failure.³²⁻³³ He had great humility and never sought fame or fortune for his research or for his role in the French resistance.³³ A colleague later wrote of Tinel that he was passionate, keen and patient in his observations, scrupulous in his publications, empathetic with his patients, and made “a solid and important contribution to the field of neurology.”³²

Johannes Cassianus Pompe (1901-1945) – A Dutch pathologist well known for describing Pompe disease, the autosomal recessively inherited condition also known as Type II glycogen storage disease, acid maltase deficiency, or alpha-1,4 glucosidase deficiency.¹⁷ He wrote a paper in 1932 and 1933 in German and French of a seven month old girl who died from what was initially thought to be pneumonia, but whose “heart

was enormous...covering a span of half a palm of a hand.”³⁴ Pompe recognized the defect in metabolism of glycogen inherent in that case of cardiomegaly, and the similarity to the cases of kidney and liver enlargement described by von Gierke in 1929. Two other articles published in Germany in the same year as Pompe’s, described children who died in infancy with cardiomegaly and severe skeletal muscle weakness with glycogen deposition.³⁴

Pompe received his medical doctorate from the University of Amsterdam in 1936 with his expanded description of “cardiomegalia glycogenica diffusa.”^{17,19} Later classification schemes in the 1950’s delineated Pompe disease as Type II glycogenosis, and the molecular defect was delineated in the 1960s.³⁴ Heterogeneity of the genetic defect may lead to the phenotypic variation seen between the classic rapidly progressive infantile type and the more recently recognized late onset juvenile/adult type.³⁴ Recombinant acid maltase therapy is being used to treat both types.³⁵

Pompe became the first anatomical pathologist in 1935 in Nijmegen at Canisius Hospital, but in 1939 moved back to take a senior post in Amsterdam.¹⁷ He was witty and friendly, and was liked and respected by all for his professional abilities. Some thought him to be manic but others thought he was just enthusiastic.¹⁷ He was very cultivated and read Sophocles in Greek, and could extensively recite works from famous Dutch playwright and author Joost van den Vondel. He was also a devout Catholic and interested in liturgy.¹⁹ Pompe’s academic output was limited during World War II, as he was a fervent patriot involved in the Dutch resistance. He kept a secret radio transmitter in his laboratory in Amsterdam at the Onze Lieve Vrouwe Gasthuis, and he was arrested and imprisoned in February, 1945. After a strategic German railway line was destroyed at St. Pancras by the resistance in April, 1945, just one month before liberation, Pompe, along with nineteen others, was shot as a retaliative measure by the Nazis.¹⁷

Ambivalent roles

Max Nonne (1860-1959) – Born in Hamburg, Germany, he received a classical education and studied medicine in Heidelberg and Berlin. He studied with famous neurologist Wilhelm Heinrich Erb at Heidelberg, and later studied neurology and syphilis in Hamburg.³⁶ While in Heidelberg he published on the syndrome of adult onset cerebellar ataxia, independently from French neurologist Pierre Marie, and the eponym “Nonne-Marie syndrome” has persisted.^{19,36} Nonne also published case reports of hereditary lymphedema of the legs in 1891, thus the eponym “Nonne-Milroy-Meige disease” was implemented.¹⁹ He also published important works on spinal cord disorders due to nutritional deficiency such as pernicious anemia. He was one of the first neurologists to correlate clinical localization with neurohistopathology.³⁶ He became director of what would become the Neurology Department at Eppendorf University Hospital in Hamburg in 1895.³⁶

Nonne was highly interested in neurosyphilis, and his classic text *“Syphilis and the nervous system”* was published in 1918 and translated into English and Spanish. He gained an international reputation, and was asked to consult in Moscow on Lenin’s fatal illness along with Bumke in 1923. He is known for the Nonne-Apelt test, a qualitative but sensitive method to



Figure 6: Karl Bonhoeffer. Photo reprinted by permission from Gütersloher Verlagshaus, Gütersloh, in der Verlagsgruppe Random House GmbH, Munich.

identify fibrin-globulin proteins in the cerebrospinal fluid in neurosyphilis using an ammonium-sulfate reagent.³⁶⁻³⁷ He developed treatment regimens for neurosyphilis based on clinical and serological follow-up methods.³⁶ Additionally, he contributed to description of pseudotumor cerebri (idiopathic intracranial hypertension) in 1904³⁸ and to the xanthochromic proteinaceous content of spinal fluid secondary to coagulation below the level of a partial or complete spinal canal obstruction (secondary to tumor) in 1910.³⁹ In 1916, he described how “traumatic neurosis” in shell shock patients was non-organic, or of psychogenic origin, and could be treated by psychotherapy and hypnosis.³⁶

Nonne believed in the motto “work well and hard, only then will you enjoy life and you will have a good time.”³⁶ He was very demanding of his pupils and trainees, but would go out of his way to help them if they were honest, loyal to neurology, and productive in their field. He was well rounded, loved to travel and lecture, loved the arts and philosophy (often interjecting quotations in his speeches), and was fluent in Latin, Greek, English, French, and Spanish.³⁶ He was generally impartial, but his strong belief in the organic nature of neurologic disease did not allow him to believe Freud’s ideas on “dream

interpretation.”³⁶ His role with the Nazi era is controversial because he wrote in 1942 that euthanasia was a “nützlicher Akt” or “useful act.”⁴⁰ He thought euthanasia to be economical, but as mentioned earlier for Hitler and the Nazis the rationale was not purely economical. On the other hand, he recognized the “folly” of the 1,000 year Reich in Germany created by Hitler, and he helped many Jewish neurologist and physician colleagues to find a new homeland outside of Germany.³⁶ He resigned as professor because “That’s going too far, I cannot and do not want to ‘Heil Hitler’ welcome to my friends.”³⁶ He received the honorary Erb gold medal and was honorary president of the German Neurological Society. That society established an annual Nonne lecture in his memory after his death in 1959, and the lecturer receives the Nonne gold medal.³⁶

Karl Bonhoeffer (1868-1948) – Born in Neresheim in southern Germany, he studied medicine in Tübingen, Berlin, and Munich. He received the chair of psychiatry at Breslau in 1904, and in 1912 the chair of psychiatry at Berlin University and the Charité Hospital. In 1908 he described what is referred to as Bonhoeffer’s reaction, or acute organic psychosis. He differentiated between exogenous psychoses characterized by impaired consciousness (delirium) and endogenous forms.⁴¹ His work led the way to the modern concept that psychopathological syndromes for somatic disturbances are limited in number and have many different etiologies, instead of being discrete disease entities, which was the previous view. Bonhoeffer recognized a change in the concept of humanity after the terrible experience of World War I, in which the value of an individual life was seen as less than before.⁴¹

Bonhoeffer originally favored forced sterilization and did not with any consistency oppose it.^{10,42} He did make a plea that those with hereditary defects, but who had unusual qualities or talents, should not be sterilized, and the genetic courts that reviewed cases and decided on compulsory sterilization did sometimes make exceptions for the artistically gifted.⁹ He taught a course on sterilization law, which included information on disorders that did not meet compulsory sterilization criteria, and this course was later banned.⁴¹ From 1934 to 1941, Bonhoeffer was a judge or court consultant to the genetic courts. Of the 126 cases in which he was involved, roughly 45% resulted in forced sterilization; the overall rate of forced sterilization in the courts was close to 89%.⁴¹ Bonhoeffer did not stand against Nazification of the German universities, and later admitted, “Unfortunately, neither I nor any of the other professors had the courage to get up and walk out in protest against the insulting attitude adopted by the Minister [for education and cultural affairs, Bernhard Rust] towards the academic profession.” He did, however, try to maintain a decent, professional, balanced atmosphere in his department.¹⁰

Bonhoeffer was a mentor and supporter of Creutzfeldt, being interested in the link between his own research on exogenous psychoses and Creutzfeldt’s histopathological studies, as well as Creutzfeldt’s established leadership potential for the neuropathological laboratories and the Clinic for Nervous Disorders of the Charité Hospital.¹⁶ Bonhoeffer recommended Creutzfeldt’s initial appointment in 1924 as well as his promotion and continual employment, and the two men had a professional and personal relationship.¹⁶ Creutzfeldt repeatedly presented his research at meetings of Bonhoeffer’s Berlin

Society for Psychiatry and Neurology, which was referred to by Julius Hallervorden (neuroscientist collaborator in Nazi crimes¹) as “the center for scientific life for Berlin neurology.”¹⁶ Bonhoeffer likely influenced Creutzfeldt and many other assistants at the Clinic to resist the pressure to join the Nazi Party, in contrast to other Charité clinics. Bonhoeffer did not hide his antipathy toward Hitler and the Nazi regime, and set a personal example through such actions as not allowing a portrait of Hitler to be hung in the Clinic.¹⁶ He strictly opposed sterilization of the mentally ill in 1923, and even in 1932 was against forced sterilization without patient consent. But he ended up agreeing to be an expert consultant, and often assigned Creutzfeldt as his representative at the genetic courts to decrease the “danger of false judgments by inadequately trained physicians.”¹⁶ He later claimed he had little opportunity to influence laws and eugenic decisions after the Nazis assumed power in 1933, but stated he never reported a patient as suffering an inherited condition.¹⁶

After he retired in 1937, Bonhoeffer opposed the appointment of Nazi doctor Maximilian de Crinis to replace him as chair of Psychiatry and Neurology.⁴¹ He reportedly wrote fake diagnoses for patients with epilepsy and schizophrenia to save them from murder after action T4 (the adult Nazi euthanasia program) started in 1939, and named medical publications that could be cited by other doctors to protect their patients.⁶ He helped his son Dietrich in contacting church groups seeking psychiatric authority to resist turning their patients over to euthanasia. Dietrich later became a celebrated Protestant martyr after he and Bonhoeffer’s other son and son-in-law were killed by the Nazis for being part of the resistance movement.¹⁰ Bonhoeffer was involved in rebuilding postwar psychiatry in West Berlin, and was made an honorary member of the American Psychiatric Association in 1948.⁴¹ Bonhoeffer thought of himself as a scientist with a “Christian-democratic mindset,” and was politically liberal. His lack of open resistance to the euthanasia programs might have been related to his desire to protect his family. He did struggle to protect Jewish co-workers and assistants and prevent their dismissal, but this is a subject of debate, as is the best way to remember him and his actions during the Nazi era.⁴¹

Oswald Bumke (1877-1950) – He was born in Stolp, Pomerania to a general practitioner father who died when he was a teenager, and a mother who came from a wealthy family. His brother Erwin was a lawyer and later became president of the courts of justice under the Nazi regime.⁴³ He was interested in becoming a math teacher, but decided on medicine instead and studied in Freiburg, then Leipzig, before finally graduating in Kiel. He started at the Psychiatric Clinic in Freiburg in 1901, but found psychiatry “boring” and began to look for another job.⁴³ He changed his mind, and in 1914 became professor and director of the psychiatric clinic in Rostock. After being disappointed with conditions there, he moved in 1915 to Breslau to become head of the clinic. He became determined to turn the psychiatric clinics into “clinics for nervous disorders” and disagreed with his friend, neurologist Otfried Foerster, who was head of the Department of Neurology and did not want the two departments consolidated. Bumke believed that the “broad overlapping of the two work areas [neurology and psychiatry] does not necessarily have to lead to strain between those involved.” He believed

psychiatric and neurologic disorders affected the same organ system, and that “lesser” neurologic disorders were psychiatric conditions with neurological symptoms (eg, conversion disorders). These disorders might have a favorable outcome.⁴³ The combined neuropsychiatry department would lead to better treatment of psychiatric patients because the stigma of psychiatric patients would be lessened, physician training would be improved especially due to more access to patients with conversion disorders, and psychiatric patients would receive better care because of in depth neurological evaluations before “purely” psychiatric diagnoses were hastily made.⁴³

Bumke moved to Leipzig in 1921 but traveled to Moscow, in 1923 along with Foerster and Nonne, among others, to the bedside of Lenin, who had had a stroke.^{19,43} He was one of first Westerners to gain insight into the leaders of the Soviet Union.⁴³ In 1924, Bumke and Foerster published supplementary volumes to a “*Handbook of Neurology*” by M. Lewandowsky.⁴³ Also in 1924, Bumke became chair of the psychiatry department at the University of Munich, where he established the combined “Psychiatric Hospital and Clinic for Nervous Diseases.” He intended to overcome “mistrust in the population with respect to a pure mental asylum,” and increased the volume of inpatient and outpatient admissions.⁴³ He then succeeded in combining neurology and psychiatry in the entire German speaking realm with the publication of the 11-volume “*Handbook on Mental*



Figure 7: Oswald Bumke. Photo courtesy of Professor H. Hippus, University Department of Psychiatry, Munich.

Diseases” in 1928-29, and the 17-volume “*Handbook of Neurology*” in 1935-37, both with Foerster. These books were popular at home and abroad and secured Bumke’s reputation.⁴³ His lectures were always very popular with his students and other faculty. He believed that for psychiatric science to progress, it needed to veer away from the experimental psychology of the past and the speculation of Freud’s psychoanalysis.⁴³ He described Bumke’s syndrome, or non-organic transient pupillary dilatation, unreactive to light or accommodation, in anxious or neurotic patients.¹⁹ He remained head of the Munich Clinic through World War II and until December, 1945 when was suspended and went through denazification until he was reinstated in 1947. He retired the same year.

Bumke’s involvement with the Nazis was conflicted. He presided at the Society for German Neurologists convention in 1934 and stated, “Gentlemen, today we have gathered in quite another Germany. Today once again each German heart is filled with hope. But this time around it is not the last onset of a people slowly tiring, but an uprising that has definitely lifted the whole of Germany out of the timidity of the postwar years, an uprising that will fortify us once more, after earnest application, internally, as well as externally.”⁴² However, that same year Bumke recommended against sterilization of patients with schizoid personality disorder instead of schizophrenia, and stated that schizophrenia could not be eliminated by sterilization because of the complexity of genetic inheritance.⁹ He argued not only against sterilization of schizophrenics, but also of epileptics and bipolar patients, because of recessive inheritance patterns.⁴⁴ To make his point, he wrote sarcastically that indiscriminate sterilization of the families of those types of patients would leave a world populated by “a few desiccated bureaucrats – and the schizophrenics.” He thought the only disorders where sterilization might work were cases of hereditary feeble-mindedness and anti-social psychopathic disorders.⁴⁴ Even as early as the 1920’s, Bumke was against racial hygiene and eugenic theories, and in 1930, he forbade transfer of patients from the clinic to be subjects of genealogical-anthropological studies by Nazi psychiatrist Ernst Rüdin.⁴³ In January 1933, he told his secretary “Don’t worry, it will all be over in three months.” In 1934, Bumke requested to resign and was turned down. He wrote a letter the same year stating that patients were avoiding being seen in clinic to avoid sterilization, and requested that the institution should only have to report hereditary diseases, but not actually file applications for sterilization. This request was granted, and many patients were able to avoid sterilization because the diagnoses were listed in such a manner as to avoid compulsory registration.⁴³ Indeed, he undermined the law by diagnosing patients with schizoid reaction instead of schizophrenia, or provided an opinion contrary to the genetic court’s opinion on whether a patient should be sterilized.⁴⁵ He wrote a letter against the expansion of the Nazi “Law for Hereditary Health” that legalized abortions in addition to sterilization for mental patients. He wrote in the “Guidelines for Abortion and Sterilization for Health Reasons” in 1936 that there was no indication to abort a pregnancy in cases of mental illness.⁴³

Later, when murder of psychiatric patients started in 1939, Bumke did not allow his patients to be transferred to another

asylum that served as a transfer point to other “death asylums.” The clinic, however, became overcrowded and eventually some patients had to be transferred, but many might have been saved by this stalling maneuver by Bumke.⁴³ He might have been involved with some other prominent neuropsychiatrists in drafting a statement against euthanasia, but there is no clear-cut evidence of this statement. Also, Bumke’s psychiatrists ignored a Nazi law against using insulin as a curative treatment for schizophrenia, which was decreed to be used only for diabetics.⁴³ But overall it seems he was mainly concerned with psychiatry’s reputation among the community being damaged by Nazi activities, not by the tragedy on an individual or family level, and stated, “Psychiatrists, as you know, were always suspected of ‘putting people away,’ and now they were not only suspected of putting them away, but there was real evidence that they were actually killing them. That was the tragedy.”⁴⁵ Bumke suffered heavy criticism after the war for not having spoken out more against the Nazi regime’s policies and activities, as it was believed his argument would have carried significant weight given his prestige, and the Nazis wouldn’t have dared to punish him. The majority of Bumke’s former assistants and many former patients and their families took his side.⁴³ In his defense, Bumke stated that anybody who openly resisted was sent to a concentration camp. He wrote in his memoirs, “Certainly, one could have gone there, if anyone would have been served by that. But this was out of the question. If I, for instance, had disappeared – because of dismissal, consignment to a camp or an ‘accident’ – then someone else would have come along. The nurses would have been at large, the patients gassed, and the students would not have been educated to become what I would call physicians. I, for one, have never cared for Don Quixote and his pranks – except for those in the novel.”⁴²

DISCUSSION

As demonstrated in the cases of the ambivalent physicians, Creutzfeldt, Nonne, Bonhoeffer, and Bumke, the most widespread resistance among neuroscientists was in the form of “silent resistance,” ranging from misdiagnosing schizophrenic patients as “neurotic,” to minimizing patients’ inability to work and emphasizing their potential to recover and contribute to society, to discharging patients to live with their families, to keeping them in general medical wards or university clinics instead of transferring them to mental hospitals which acted as killing centers. In fact, many of the doctors and nurses who helped neuropsychiatric patients were ambivalent, and could silently resist in one instance, and participate in the killing at other times.¹⁰ Likely, the ambivalent ones felt they “did the best they could.” As Bumke stated, he did not approve of the “Don Quixote” way of conducting oneself, and if he behaved too irresponsibly he would have been caught and jailed and not able to protect other patients and provide for their families. For Bumke, Bonhoeffer, and Creutzfeldt, making false diagnoses and preventing patient transfers were limited tools for resistance and protest and could only be undertaken as exceptions. Otherwise, suspicions would be aroused and limited ward capacities of the university clinics would become overcrowded.¹⁶ They probably knew that if they resisted only some of the time it would more likely go unnoticed by the Nazi regime.¹⁰ They were pragmatic and did what was feasible under

the circumstances to provide for and protect their patients or colleagues, while at the same time not exposing themselves to undue personal or professional risk.¹⁶ One can certainly argue, however that even the silent resistance by these individuals had a significant impact,¹⁰ as partly exemplified by the many letters of condolence from former patients or their families sent to Creutzfeldt's widow after his death.¹⁶

The fearless open resistance of Oskar and Cécile Vogt may have only been possible because of strong political and financial support from the wealthy and influential Krupp family in Germany, as well as support from the Rockefeller Foundation.^{11,13,15} Even when Oskar Vogt was removed from directorship of the Kaiser Wilhelm Institute in 1937, the Krupp family provided the funding to establish the Vogts' own new brain research institute in Neustadt (Black Forest, Germany), where they continued their work until the end of their lives.^{11,13,15} The Vogts are similar in having political connections to another well known open resistor and opponent of the euthanasia program, psychiatrist Gottfried Ewald, who may have had some sense of security given personal connections to Hermann Göring.¹⁰ Ewald stated, "On principle I would not lend my hand to exterminate in this way patients entrusted to me." Ewald risked being sent to a concentration camp, though, when he drafted a memorandum in 1940 to several top Nazi medical officials and to Göring, stating he was against the euthanasia program because there was no sense of imminent starvation of the German population and misallocation of resources to mentally disabled to justify "interference with fate," the euthanasia principle was against the true meaning of the word which was to voluntarily alleviate suffering in terminally ill patients, there was potential for abuse by indigent people to euthanize family members because of "economic burden," there were "certain medical objections" such as the fact that some mental disabilities might be treatable and some therapies were known to be successful, fear and distrust of doctors would be promulgated, and that killing patients against the wishes of the family and not in cases with a "compelling need" was against the main tenet of being a physician which was to help and comfort others.¹⁰ Ewald later may have been part of a group of psychiatrists who wanted to declare Hitler insane.¹⁰ Oswald Bumke, like Ewald, used the rationale of ubiquitous patient distrust of psychiatrists in his arguments to try to save some of his patients. Possibly, Bumke and Ewald were paradoxically feeding into Nazi desire to have more patients come to the clinic by arguing that point, and at least in Bumke's case, false diagnoses could be made to potentially protect the patients once they came to the clinic.

Bonhoeffer was clearly influenced by Christian teachings in his attitudes toward Nazi policies, and his son was a Protestant martyr. Similarly, Ewald was the son of a Protestant minister, thus his religious background may have influenced his compassion and sympathy for his patients.¹⁰ Spielmeyer, Tinel, and Pompe may have all been influenced in their desire to resist by their strong Christian background and upbringing, similar to Freiburg pathologist Franz Büchner, who was a devout Catholic deeply influenced by his religious conviction. He frequently spoke out against the Nazi policy of euthanasia in his lectures in 1941, influencing many medical students and army doctors who were home from the war front. Many of these medical students,

who increasingly resented and criticized the Nazi regime, were deeply religious as well. Büchner also protested in vain to his superior after, as consulting pathologist to the German army, he attended a conference in 1942 in which arch Nazi physician Sigmund Rascher described the cold water survival experiments on prisoners in the Dachau concentration camp. Luckily Büchner did not suffer consequences for this action,^{23,42,46} and after the war in 1945 and 1946, he continued to remind his students of the ethical principles of Christianity and the Hippocratic Oath.⁶ Unluckily for Pompe, and for humanity which lost a great medical scientist, the Nazis claimed him as another victim. Tinel and his family also unluckily became Nazi victims, either through imprisonment or death. Whether and how much brain research on euthanasia victims would have taken place at the German Research Institute for Psychiatry in Munich if Spielmeyer had remained in charge (after his untimely death in 1935 he was succeeded by Scholz) is purely a matter of speculation. As mentioned in Part I,¹ the work of neuroscientists (e.g., Scholz) who collaborated with the Nazis lent moral and scientific legitimacy to Nazi policies, and likely encouraged their actions.

The extent to which international reputation and fame allowed some of the neuroscientists to feel protected from harm by the Nazis is unknown, but likely played a role. As mentioned, Bumke enjoyed a strong reputation at home and abroad for his achievements in neuroscience, an example of which was his selection along with Nonne and others to examine Lenin in Moscow after Lenin began to have a series of strokes.⁴³ The Vogts also were selected to examine Lenin's brain after his death, due to their strong international reputation.^{11,15} Nonne and Spielmeyer also enjoyed international reputations in neuroscience before and during the Nazi era. Indeed, there is evidence that scientific reputation afforded some, but not full, protection against punishment by the Nazis. Hamburg pediatrician Rudolf Degkwitz was originally sympathetic to the Nazis, but began to loathe the regime and made many critical remarks in front of his students, and was tried by a people's court in 1944 and only imprisoned for the duration of the war, not executed (unlike many others) because he had done "epochal" early work toward measles prevention.⁴² Of course, strong national patriotism served as a motivation for the resistance of Saethre in Norway, Tinel in France, and Pompe in Holland. But even Tinel's international neuroscience reputation did not save him and his family from punishment by the Nazis. The altruistic Saethre also not only did not escape Nazi terror despite his international reputation, but may have been especially targeted for Nazi reprisals against the resistance movement because of his standing in the community.

It is possible that geographic location and local culture and attitudes may have influenced resistance by neuroscientists against the Nazis. Saethre was joined in resistance by multiple other doctors in Norway. Anton Jervell, a Norwegian cardiologist famous for Jervell and Lange-Nielsen Syndrome (congenital deafness and syncopal episodes), was involved in the resistance and sheltered refugees in his home and his hospital, and seems to have luckily escape punishment by the Nazis, unlike Saethre.¹⁸ Otto Mohr was a distinguished Norwegian geneticist famous for Mohr Syndrome (oro-facial-digital syndrome Type II) and discovering the genetic basis of

phenylketonuria.¹⁷ He was president of the Norwegian Academy of Sciences and gave lectures at Harvard University, but was dismissed by the Nazis in 1940 because of opposition to eugenic policies. He was imprisoned in a concentration camp but survived the war and returned to his profession.¹⁷ In Holland, Pompe was joined in resistance by Petrus Johannes Waardenburg, an ophthalmologist famous for co-describing Klein-Waardenburg syndrome (iris heterochromia, dystopia canthorum, white forelock, patchy skin depigmentation, and deafness). He was courageous, had a strong personality, and openly condemned Hitler and the racist, anti-Semitic Nazi policies, even publishing such sentiments during the German occupation. Luckily, he was not punished by the Nazis.^{2,12,17} In addition, Dutch physicians unanimously resisted even the first subtle effort to “Nazify” the profession in Holland.⁴⁷ The Reich Commissar in the Occupied Netherlands Territories stated (as part of his order dated December 19, 1941), “It is the duty of the doctor, through advice and effort, conscientiously and to his best ability, to assist as helper the person entrusted to his care in the maintenance, improvement and re-establishment of his vitality, physical efficiency and health. The accomplishment of this duty is a public task.” The Dutch physicians recognized this seemingly innocuous statement as Nazi propaganda intended to indoctrinate physicians and the public that the physician’s primary duty was to rehabilitate the sick to be useful laborers, and to eliminate doctor-patient privacy.⁴⁷ When Dutch doctors declared they would not obey this order, they were threatened with revocation of their medical licenses. They turned in their licenses, took down their shingles, ceased writing death or birth certificates, and continued to see their patients privately. The Reich Commissar retreated but still tried to persuade the physicians. When they still refused, he arrested 100 Dutch doctors and sent them to concentration camps. However, not a single euthanasia or non-therapeutic sterilization was ordered or participated in by a Dutch physician throughout the occupation.⁴⁷ In Hamburg, Germany, “Anglophile” young doctors met with other sympathetic intellectuals in furtive locations, discussing “degenerate” art, Hitler’s hubris and folly, and banned books, while dancing away the nights with like-minded women to American swing music.⁴⁶ To what extent this youthful cultural resistance to the Nazis in Hamburg may have influenced the resistance and attitude of neuroscientist Max Nonne, or pediatrician Rudolf Degkwitz, is a matter of speculation, though it is conceivable that they were aware of these local attitudes.

CONCLUSIONS

Historian Robert Proctor asks the question “what defines resistance?”⁷ and historian Michael Kater points out that we cannot paint resistors as simply black or white, but as shades of grey, because they all had had various motivations.^{39,46} In the case of Creutzfeldt, Bonhoeffer, Nonne, and Bumke, there was more passive and at times ambivalent resistance, more common of the resistance that was widespread among doctors to a certain extent in Nazi Germany. These neuroscientists were able to help some but not all of their colleagues and their patients, while affording some level of protection to themselves both personally and professionally. In the case of the Vogts, Mitscherlich, Saethre, Spielmeyer, Tinel, and Pompe, there was a feeling that more open resistance was justified and necessary to combat the

evil that Hitler and the Nazis inflicted upon their colleagues and friends, upon neurologic and psychiatric patients, and upon the rest of Europe. Spielmeyer, Tinel, Pompe, and Bonhoeffer were likely influenced by strong Christian principles of protection of the weak and not doing harm unto others, similar to what Bishop von Galen preached in his sermons in Germany. Saethre may have been influenced by a strong sense of altruism and by the Hippocratic Oath. Saethre, Tinel, and Pompe were also ardent patriots who helped their respective countries’ underground resistance efforts against the Nazis, paying with their own life or the life of a family member. Some of the neuroscientists, such as the Vogts, Nonne, Spielmeyer, and Bumke, had great international scientific reputations at the time the Nazis came into power, which may have protected them somewhat from Nazi terror, and allowed them to resist in the manner that they did. The Vogts also benefited politically and financially from wealthy benefactors who supported them even when they were targeted by the Nazis because of their attitudes and resistance. Mitscherlich, Saethre, Tinel, and Pompe were not protected at all, and suffered imprisonment or death because of the roles they played. Local attitudes and culture may have influenced the resistance of Saethre in Norway, Pompe in Holland, and Nonne in Hamburg. The question often asked of “gentiles” who helped Jews during this same period is, “how could these people have put their own lives or freedom at risk to help strangers?” The Yad Vashem Holocaust Museum in Jerusalem nominates as “righteous among the nations” those who helped Jews at great personal risk to themselves.⁴⁸ It would seem that Haakon Saethre as well as Oskar and Cécile Vogt should be on Yad Vashem’s list for the role they played in protecting Jews, though they currently are not on the list. The other neuroscientists discussed in this paper, even the ambivalent ones, deserve to be commended as well because for one reason or another, they were able to protect colleagues or friends, or uphold the Hippocratic Oath and protect at least some of their patients, when the overwhelming majority of their colleagues silently cooperated or even collaborated with Nazi policies. These neuroscientists should serve as an example of “doing the right thing” as physicians, no matter what the political landscape, and all neuroscientists should be aware of their deeds.

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